

# Model 317

## HFF HCMOS VCXO

### Features

- Ceramic Surface Mount Package
- Ultra-Low Phase Jitter Performance
- High Frequency Fundamental Crystal Design
- Frequency Range 100 – 170MHz \*
- +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-418



Part Dimensions:  
7.0 × 5.0 × 2.0mm • 178.462mg

### Applications

- Small Cells
- Wireless Communication
- Broadband Access
- SONET/SDH/DWDM
- Base Stations
- Ethernet/GbE/SyncE
- Digital Video
- Test and Measurement

#### Standard Frequencies

- 100.00MHz
- 122.88MHz
- 125.00MHz
- 153.60MHz
- 155.52MHz
- 156.25MHz
- 166.00MHz

\* Check with factory for availability.

### Description

CTS Model 317 is a low cost, small size, high performance VCXO. Employing the latest IC technology, coupled with a high frequency fundamental crystal, M317 has excellent stability and low jitter/phase noise performance.

### Ordering Information

| Model                               | Supply Voltage   | Absolute Pull Range   | Frequency Stability | Temperature Range | Frequency Code [MHz] | Packaging |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|-------------------------------------|--|---|---------------------|-------------------|----------------------|-----------|---|---|-----------|-------------|--------|----------------|--------|----------------|---|------|--|------|--------------|-------------------------------------|--|--|
| 317                                 | L  | B   | 3                   | I                 | XXX or XXXX          | T         |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|                                     | <table border="1"> <thead> <tr> <th>Code</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>+3.3V ±5%</td> </tr> </tbody> </table> | Code  | Voltage             | L                 | +3.3V ±5%            |           | <table border="1"> <thead> <tr> <th>Code</th> <th>Stability</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>±50ppm</td> </tr> <tr> <td>5</td> <td>±25ppm</td> </tr> <tr> <td>6</td> <td>±20ppm<sup>1</sup></td> </tr> </tbody> </table> | Code  | Stability | 3           | ±50ppm | 5              | ±25ppm | 6              | ±20ppm <sup>1</sup>   |      | <table border="1"> <thead> <tr> <th>Code</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td colspan="2">Product Frequency Code<sup>2</sup></td> </tr> </tbody> </table> | Code | Frequency    | Product Frequency Code <sup>2</sup> |  |  |
| Code                                | Voltage  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| L                                   | +3.3V ±5%  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Stability  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 3                                   | ±50ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 5                                   | ±25ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| 6                                   | ±20ppm <sup>1</sup>  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Frequency  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Product Frequency Code <sup>2</sup> |  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
|                                     |  | <table border="1"> <thead> <tr> <th>Code</th> <th>APR</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>±50ppm</td> </tr> </tbody> </table> | Code                | APR               | B                    | ±50ppm    |   | <table border="1"> <thead> <tr> <th>Code</th> <th>Temp. Range</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>-20°C to +70°C</td> </tr> <tr> <td>I</td> <td>-40°C to +85°C</td> </tr> </tbody> </table> | Code      | Temp. Range | C      | -20°C to +70°C | I      | -40°C to +85°C | <table border="1"> <thead> <tr> <th>Code</th> <th>Packing</th> </tr> </thead> <tbody> <tr> <td>T</td> <td>1k pcs./reel</td> </tr> </tbody> </table> | Code | Packing  | T    | 1k pcs./reel |                                     |  |  |
| Code                                | APR  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| B                                   | ±50ppm   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Temp. Range  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| C                                   | -20°C to +70°C   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| I                                   | -40°C to +85°C   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| Code                                | Packing  |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |
| T                                   | 1k pcs./reel   |   |                     |                   |                      |           |   |   |           |             |        |                |        |                |   |      |  |      |              |                                     |  |  |

#### Notes:

- 1] Only available with "C" temperature range.
- 2] Refer to document 016-1454-0, Frequency Code Tables.  
3-digits for frequencies <100MHz, 4-digits for frequencies 100MHz or greater.

**Not all performance combinations and frequencies may be available.  
Contact your local CTS Representative or CTS Customer Service for availability.**

## Electrical Specifications

### Operating Conditions

| PARAMETER               | SYMBOL    | CONDITIONS   | MIN        | TYP | MAX        | UNIT             |
|-------------------------|-----------|--|------------|-----|------------|------------------|
| Maximum Supply Voltage  | $V_{CC}$  | -  | -0.5       | -   | 5.0        | V                |
| Maximum Control Voltage | $V_C$     | -  | -0.5       | -   | $V_{CC}$   | V                |
| Supply Voltage          | $V_{CC}$  | ±5%  | 3.14       | 3.3 | 3.47       | V                |
| Supply Current          | $I_{CC}$  | Typical @ $C_L = 15$ pF, $T_A = +25^\circ\text{C}$ | -          | 20  | 30         | mA               |
| Output Load             | $C_L$     | -  | -          | -   | 15         | pF               |
| Operating Temperature   | $T_A$     | -  | -20<br>-40 | +25 | +70<br>+85 | $^\circ\text{C}$ |
| Storage Temperature     | $T_{STG}$ | -  | -40        | -   | +100       | $^\circ\text{C}$ |

### Frequency Stability

| PARAMETER                       | SYMBOL            | CONDITIONS  | MIN | TYP          | MAX | UNIT |
|---------------------------------|-------------------|---|-----|--------------|-----|------|
| Frequency Range                 | $f_0$             | -   |     | 100 - 170    |     | MHz  |
| Frequency Stability<br>[Note 1] | $\Delta f/f_0$    | ±20ppm stability, -20 $^\circ\text{C}$ to +70 $^\circ\text{C}$ only |     | 20, 25 or 50 |     | ±ppm |
| Absolute Pull Range<br>[Note 2] | APR               | -   | 50  | -            | -   | ±ppm |
| Aging                           | $\Delta f/f_{25}$ | First Year @ +25 $^\circ\text{C}$ , nominal $V_{CC}$ and $V_C$      | -3  | -            | 3   | ppm  |

1.] Inclusive of initial tolerance at time of shipment, changes in supply voltage, load, temperature and 1st year aging.

2.] Minimum guaranteed frequency shift from  $f_0$  over variations in temperature, aging, power supply and load.

### Output Parameters

| PARAMETER              | SYMBOL               | CONDITIONS   | MIN               | TYP    | MAX               | UNIT          |
|------------------------|----------------------|--|-------------------|--------|-------------------|---------------|
| Output Type            | -                    | -  |                   | HCMOS  |                   | -             |
| Output Voltage Levels  | $V_{OH}$<br>$V_{OL}$ | Logic '1' Level, CMOS Load<br>Logic '0' Level, CMOS Load | 0.9 $V_{CC}$<br>- | -<br>- | -<br>0.1 $V_{CC}$ | V             |
| Output Duty Cycle      | SYM                  | @ 50% Level  | 45                | -      | 55                | %             |
| Rise and Fall Time     | $T_R, T_F$           | @ 20%/80% Levels   | -                 | 1.5    | 3.0               | ns            |
| Start Up Time          | $T_S$                | Application of $V_{CC}$                                  | -                 | -      | 5                 | ms            |
| <b>Enable Function</b> |                      |  |                   |        |                   |               |
| Enable Input Voltage   | $V_{IH}$             | Pin 2 Logic '1', Output Enabled                          | 0.7 $V_{CC}$      | -      | -                 | V             |
| Disable Input Voltage  | $V_{IL}$             | Pin 2 Logic '0', Output Standby                          | -                 | -      | 0.3 $V_{CC}$      | V             |
| Standby Current        | $I_{STB}$            | Pin 2 Logic '0', Output Standby                          | -                 | -      | 10                | $\mu\text{A}$ |
| Enable Time            | $T_{PLZ}$            | Pin 2 Logic '1'  | -                 | -      | 2                 | ms            |
| Phase Jitter, RMS      | $t_{jrms}$           | Bandwidth 12 kHz - 20 MHz                                | -                 | 50     | 500               | fs            |
| Phase Noise            | -                    | See Typical Plots  | -                 | -      | -                 | -             |

### Enable Truth Table

| Pin 2     | Pin 4     |
|-----------|-----------|
| Logic '1' | Output    |
| Open      | Output    |
| Logic '0' | High Imp. |

## Electrical Specifications

### Control Voltage

| PARAMETER           | SYMBOL         | CONDITIONS                        | MIN  | TYP         | MAX  | UNIT  |
|---------------------|----------------|-----------------------------------|------|-------------|------|-------|
| Control Voltage     | $V_C$          | -                                 | 0.30 | 1.65        | 3.00 | V     |
| Frequency Deviation | $\Delta f/f_0$ | $V_C = 0.0V$                      |      | -155 to -75 |      | ppm   |
|                     |                | $V_C = 3.3V$                      |      | 75 to 155   |      |       |
| Linearity           | L              | Best Straight Line Fit            | -    | 5           | 10   | %     |
| Gain Transfer       | $K_V$          | Pull Sensitivity; @ +1.65V, +25°C | -    | 65          | -    | ppm/V |
| Input Impedance     | $Z_{V_C}$      | -                                 | 100  | -           | -    | kOhms |
| Modulation Roll-off | -              | @ -3dB                            | 20   | -           | -    | kHz   |
| Transfer Function   | -              | -                                 |      | Positive    |      | -     |

### Test Circuit

HCMOS



### Output Waveform

HCMOS

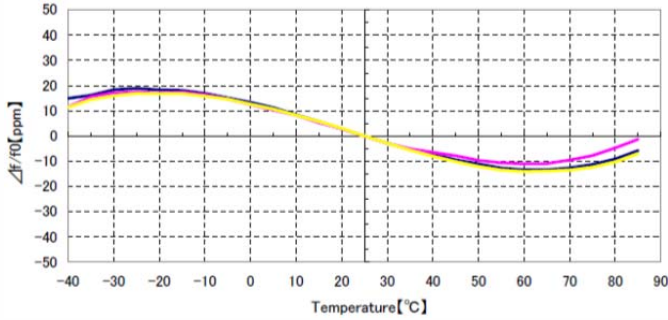


## Electrical Specifications

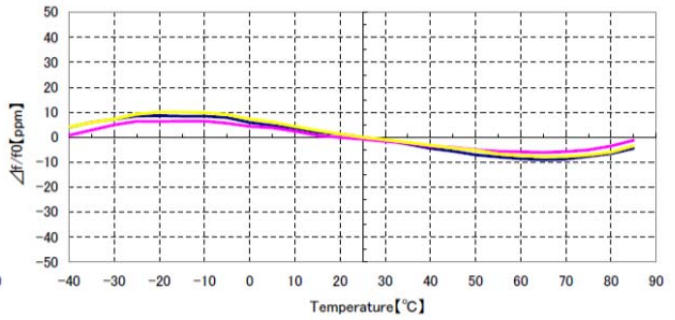
### Performance Data

#### Frequency Deviation – Over Temperature [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$

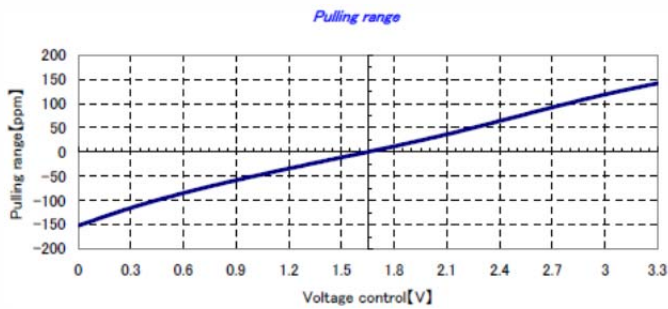


156.25MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$

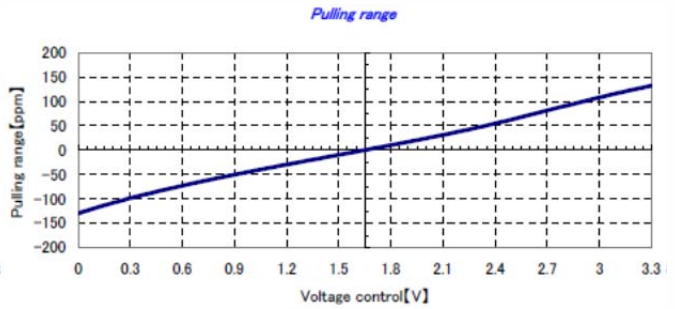


#### Frequency Deviation – Pulling Range [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$

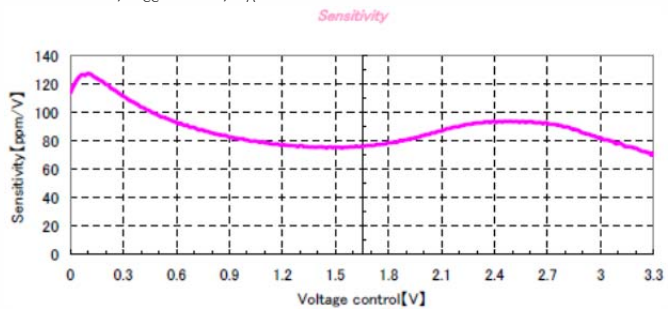


156.25MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$

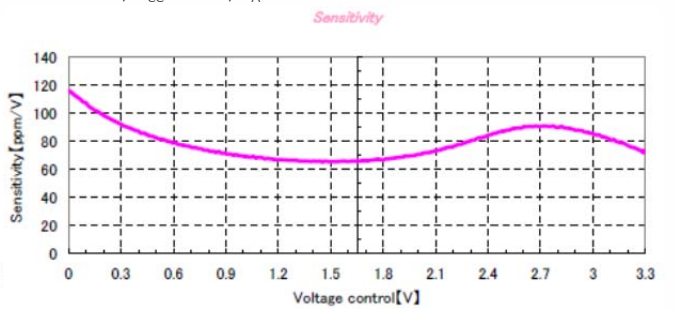


#### Frequency Deviation – Gain Transfer [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$



156.25MHz,  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ V$



### Electrical Specifications

#### Performance Data

##### Phase Noise [typical]

122.88MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$ ,  $T_A = +25^\circ C$



156.25MHz,  $V_{CC} = 3.3V$ ,  $V_C = 1.65V$ ,  $T_A = +25^\circ C$



## Mechanical Specifications

### Package Drawing



### Marking Information

- \*\* - Manufacturing Site Code.
- D – Date Code. See Table I for codes.
- ST – Frequency Stability/Temperature Code. [Refer to Ordering Information]
- V – Voltage Code. L = 3.3V
- xxxx – Frequency Code. 4-digits required for frequencies 100MHz and above. [See document 016-1454-0, Frequency Code Tables.]

### Recommended Pad Layout



### Notes

- Termination pads (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
- Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
- MSL = 1.

### Pin Assignments

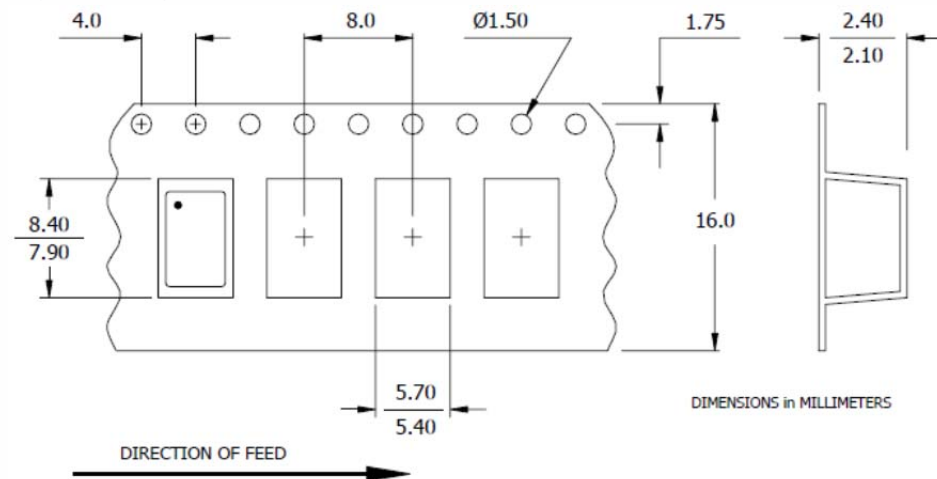
| Pin | Symbol          | Function          |
|-----|-----------------|-------------------|
| 1   | V <sub>C</sub>  | Control Voltage   |
| 2   | EOH             | Enable            |
| 3   | GND             | Circuit & Package |
| 4   | Output          | RF Output         |
| 5   | N.C.            | No Connect        |
| 6   | V <sub>CC</sub> | Supply Voltage    |

Table I - Date Code

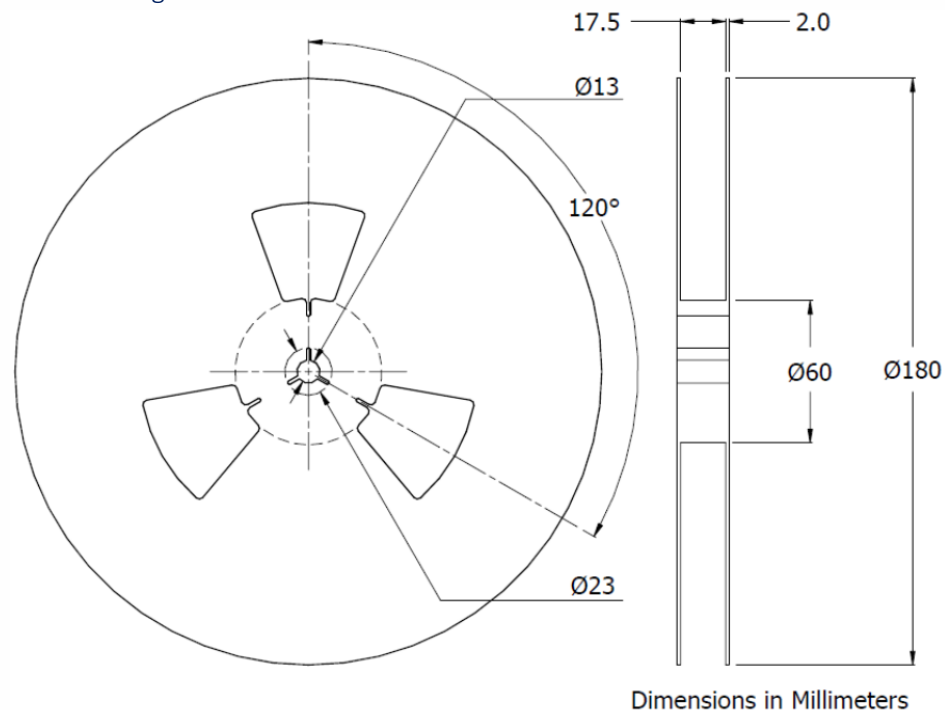
| YEAR |      | MONTH |      |      |     |     |     |     |     |     |     |     |     |   |   |   |
|------|------|-------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|---|
|      |      | JAN   | FEB  | MAR  | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |   |   |   |
| 2001 | 2005 | 2009  | 2013 | 2017 | A   | B   | C   | D   | E   | F   | G   | H   | J   | K | L | M |
| 2002 | 2006 | 2010  | 2014 | 2018 | N   | P   | Q   | R   | S   | T   | U   | V   | W   | X | Y | Z |
| 2003 | 2007 | 2011  | 2015 | 2019 | a   | b   | c   | d   | e   | f   | g   | h   | j   | k | l | m |
| 2004 | 2008 | 2012  | 2016 | 2020 | n   | p   | q   | r   | s   | t   | u   | v   | w   | x | y | z |

### Packaging - Tape and Reel

#### Tape Drawing



#### Reel Drawing



#### Notes

1. Device quantity is 1k pieces maximum per 180mm reel.
2. Complete CTS part number, frequency value and date code information must appear on reel and carton labels.



## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

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Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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