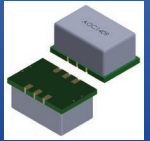


# High-Stability & Ultra-Low Phase Noise SMD OCXO/VCOCXO



AOC1409 Series



ESD Sensitive

14.9 x 9.7 x 7.0mm  
RoHS/RoHS II Compliant  
MSL = 1

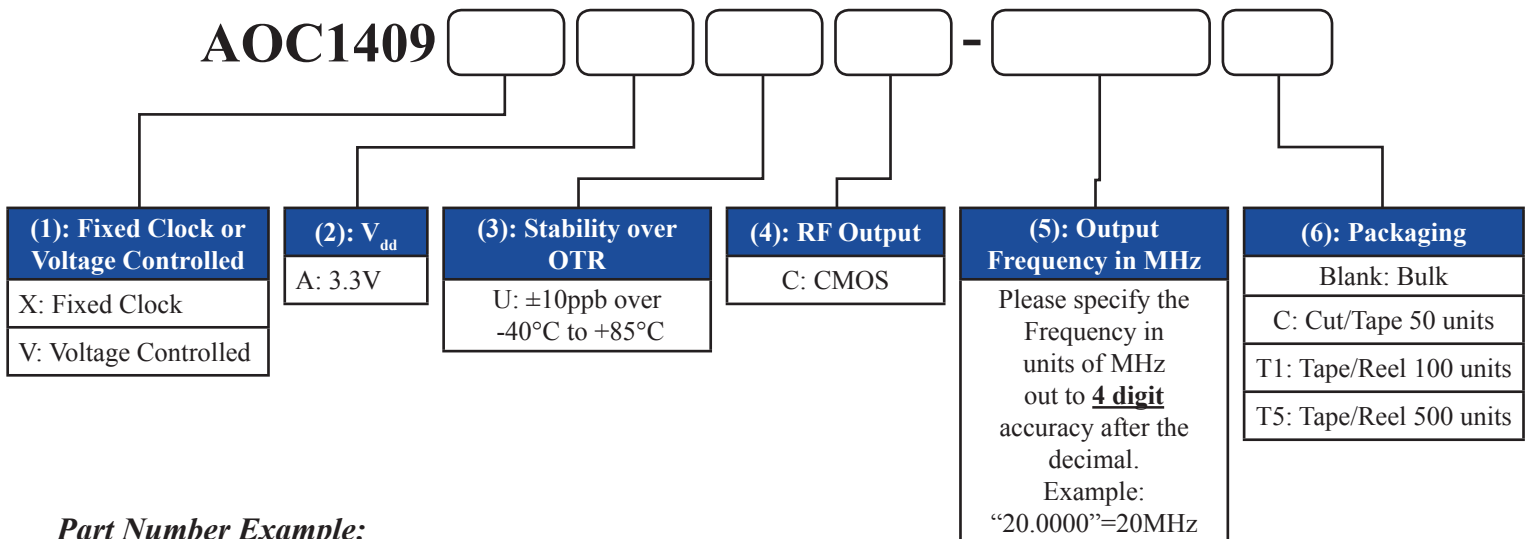
## Features

- Extremely low long-term aging:  $\pm 700$ ppb over 20 years
- Stability over temperature:  $\pm 10$ ppb over  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Excellent phase noise:  
( $-138\text{dBc/Hz}$  typ. @ 100Hz offset,  $-148\text{dBc/Hz}$  typ. @ 1kHz offset)
- 20.0MHz carrier frequency
- 14.9 x 9.7mm, 6-pin SMD reflow-solderable package
- 3.3 V<sub>dd</sub> supply
- SC-Cut, High “Q” resonator-based design

## Applications

- Stratum 3 & Stratum 3E compliant
- Cellular infrastructure; Base stations
- Test & measurement equipment
- Switches & routers
- Time & frequency references
- Precision GPS

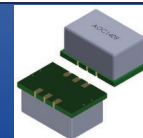
## Part Identification



### Part Number Example:

**AOC1409VAUC-20.0000C**

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MSL = 1

## Electrical Specifications

| Parameters                                                  | Min.               | Typical                | Max.                   | Unit   | Notes                                     |
|-------------------------------------------------------------|--------------------|------------------------|------------------------|--------|-------------------------------------------|
| Frequency (Fc)                                              | 20.0000            |                        |                        | MHz    |                                           |
| Operating Temperature Range                                 | -40                |                        | +85                    | °C     |                                           |
| Storage Temperature Range                                   | -40                |                        | +100                   | °C     |                                           |
| Supply Voltage (V <sub>dd</sub> )                           | +3.135             | +3.3                   | +3.465                 | V      |                                           |
| Power Consumption (warm-up)                                 |                    |                        | 2.5                    | W      |                                           |
| Current Consumption (warm-up)                               |                    |                        | 722                    | mA     | @ Max V <sub>dd</sub> = +3.465V           |
| Power Consumption (steady-state @+25°C)                     |                    |                        | 1.0                    | W      |                                           |
| Current Consumption (steady-state @+25°C)                   |                    |                        | 289                    | mA     | @ Max V <sub>dd</sub> = +3.465V           |
| Frequency Accuracy (calibration)                            |                    | ≤ ±100                 | ±200                   | ppb    | See Note 1                                |
| Frequency Stability over Operating Temperature Range        |                    |                        | ±10.0                  | ppb    | See Note 2                                |
| Frequency Stability vs. Supply Voltage Change               |                    |                        | ±5.0                   | ppb    | V <sub>dd</sub> ±5%; (Vc=constant)        |
| Frequency Stability vs. Load Change                         |                    |                        | ±2.0                   | ppb    | Load=15pF±10%                             |
| Aging Daily                                                 |                    |                        | ±1.0                   | ppb    |                                           |
| Aging 1 <sup>st</sup> Year                                  |                    |                        | ±100                   | ppb    |                                           |
| Aging 20 Years                                              |                    |                        | ±500                   | ppb    |                                           |
| All-Inclusive Frequency Tolerance over 20 Year Product Life |                    |                        | ±700                   | ppb    | See Note 3                                |
| Warm-Up Time                                                |                    |                        | 3                      | min.   | See Note 4                                |
| Output Signal                                               | LVCMOS             |                        |                        |        |                                           |
| Output Load                                                 | 13.5               | 15                     | 16.5                   | pF     |                                           |
| Duty Cycle                                                  | 45                 | 50                     | 55                     | %      | @ 50% V <sub>dd</sub>                     |
| Output High Voltage (V <sub>OH</sub> )                      | V <sub>OH</sub>    | 0.9*(V <sub>dd</sub> ) |                        | V      | Load=15pF±10%;<br>V <sub>dd</sub> = +3.3V |
| Output Low Voltage (V <sub>OL</sub> )                       | V <sub>OL</sub>    |                        | 0.1*(V <sub>dd</sub> ) |        |                                           |
| Rise (Tr) / Fall (Tf) Time                                  |                    |                        | 6                      | ns     |                                           |
| Center Control Voltage (Vc)                                 |                    | +1.65                  |                        | V      | Voltage-Controlled Option<br>(VCOCXO)     |
| Control Voltage Range                                       | +0.0               |                        | +3.3                   | V      |                                           |
| Frequency Pullability                                       | ±0.7               |                        |                        | ppm    |                                           |
| Control Port Input Impedance                                | 100                |                        |                        | kΩ     |                                           |
| EFC Linearity                                               |                    |                        | ±10                    | %      |                                           |
| Tuning Slope                                                | Positive Monotonic |                        |                        |        |                                           |
| Phase Noise (@ 25 °C)                                       |                    | -85                    |                        | dBc/Hz | Offset @1Hz                               |
|                                                             |                    | -115                   |                        |        | Offset @10Hz                              |
|                                                             |                    | -138                   |                        |        | Offset @100Hz                             |
|                                                             |                    | -148                   |                        |        | Offset @1kHz                              |
|                                                             |                    | -152                   |                        |        | Offset @10kHz                             |
|                                                             |                    | -154                   |                        |        | Offset @100kHz                            |

Note 1: @ +25°C; initial set-tolerance frequency (relative to carrier) at time of shipment, pre-reflow

Note 2: Over -40°C to +85°C; relative to stabilized frequency after 1 hour of continuous operation, post-reflow

Note 3: Over -40°C to +85°C; includes stability over temperature, initial frequency accuracy (calibration), load pulling, power supply variation, and 20 years aging

Note 4: @ +25°C; within ±10ppb of F, where F is the stabilized frequency reached after 1 hour of continuous operation

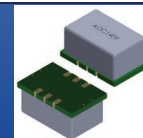


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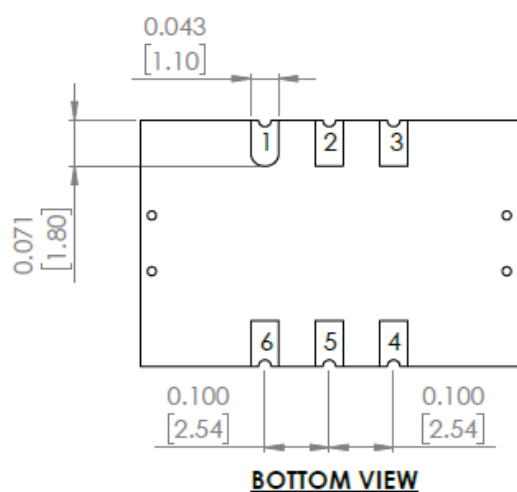
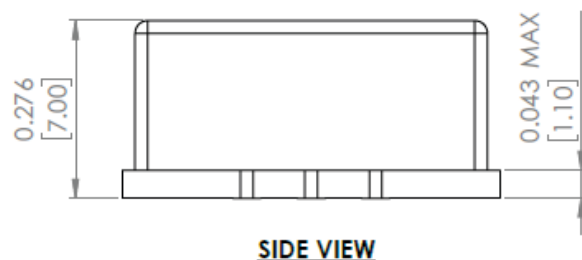
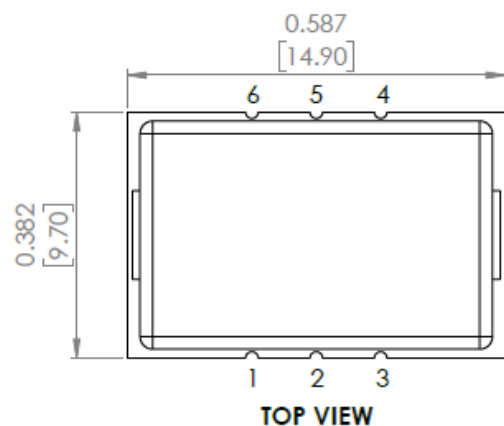
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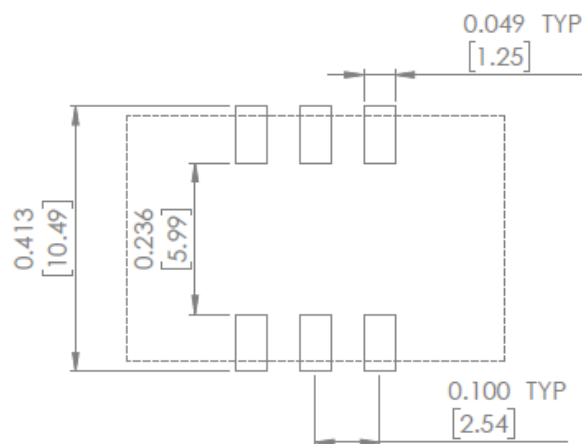
ESD Sensitive 

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RoHS/RoHS II Compliant  
MSL = 1

## Mechanical Dimensions



## RECOMMENDED LAND PATTERN



| Pin # | Function                                                                   |
|-------|----------------------------------------------------------------------------|
| #1    | <u>Option V:</u><br>Voltage-Control (Vc)<br><u>Option X:</u><br>No Connect |
| #2    | <i>Do Not Connect (DNC)</i> <sup>[Note 5]</sup>                            |
| #3    | GROUND                                                                     |
| #4    | Output                                                                     |
| #5    | <i>Do Not Connect (DNC)</i> <sup>[Note 5]</sup>                            |
| #6    | Supply Voltage (V <sub>dd</sub> )                                          |

Dimensions: inches [mm]

Note 5: Do not electrically connect pins #2 & #5 as they are for factory use only.

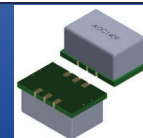


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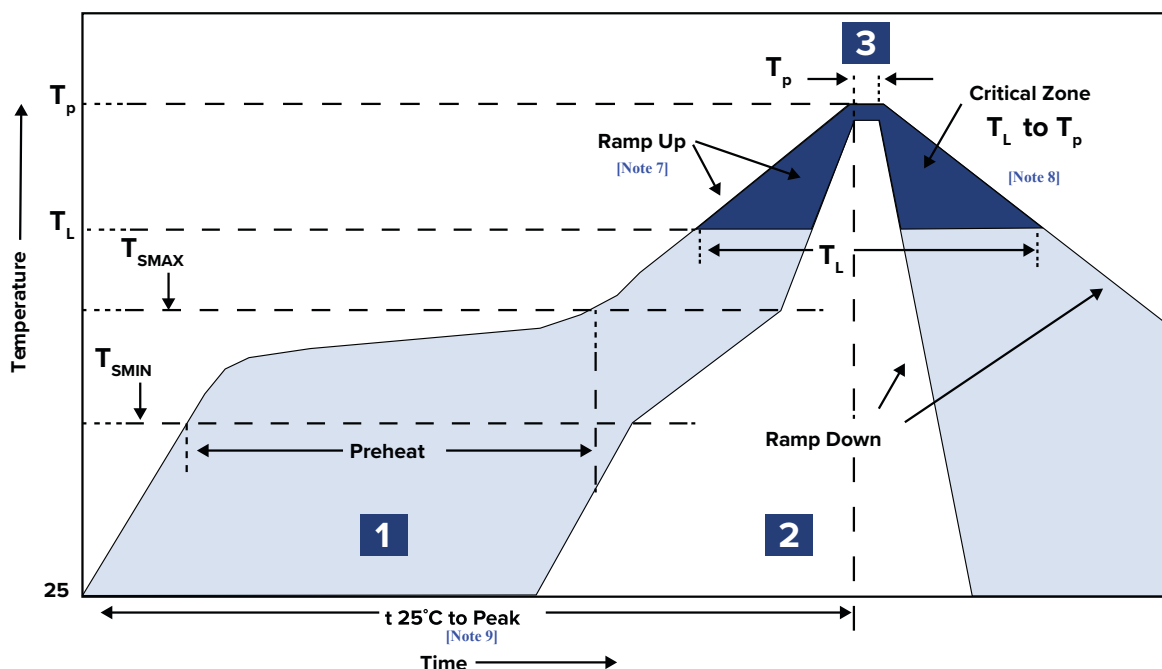
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RoHS/RoHS II Compliant  
MSL = 1

## Recommended Reflow Profile <sup>[Note 6]</sup>



| Zone | Description    | Temperature                                                  | Time          |
|------|----------------|--------------------------------------------------------------|---------------|
| 1    | Preheat / Soak | $T_{SMIN} \sim T_{SMAX}$<br>$150^{\circ}C \sim 200^{\circ}C$ | 60 ~ 180 sec. |
| 2    | Reflow         | $T_L$<br>$217^{\circ}C$                                      | 60 ~ 150 sec. |
| 3    | Peak heat      | $T_P$<br>$260^{\circ}C \pm 5^{\circ}C$                       | 20 ~ 40 sec.  |

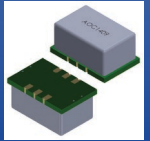
Note 6: Can withstand 2 times reflow; all temperatures refer to topside of the package, measured on the package body surface

Note 7: Ramp Up Rate ( $T_L \rightarrow T_P$ ) =  $3^{\circ}C / \text{sec. MAX}$

Note 8: Ramp Down Rate ( $T_P \rightarrow T_L$ ) =  $6^{\circ}C / \text{sec. MAX}$

Note 9: Time  $25^{\circ}C$  to Peak Temperature ( $25^{\circ}C \rightarrow T_P$ ) = 8 minutes MAX

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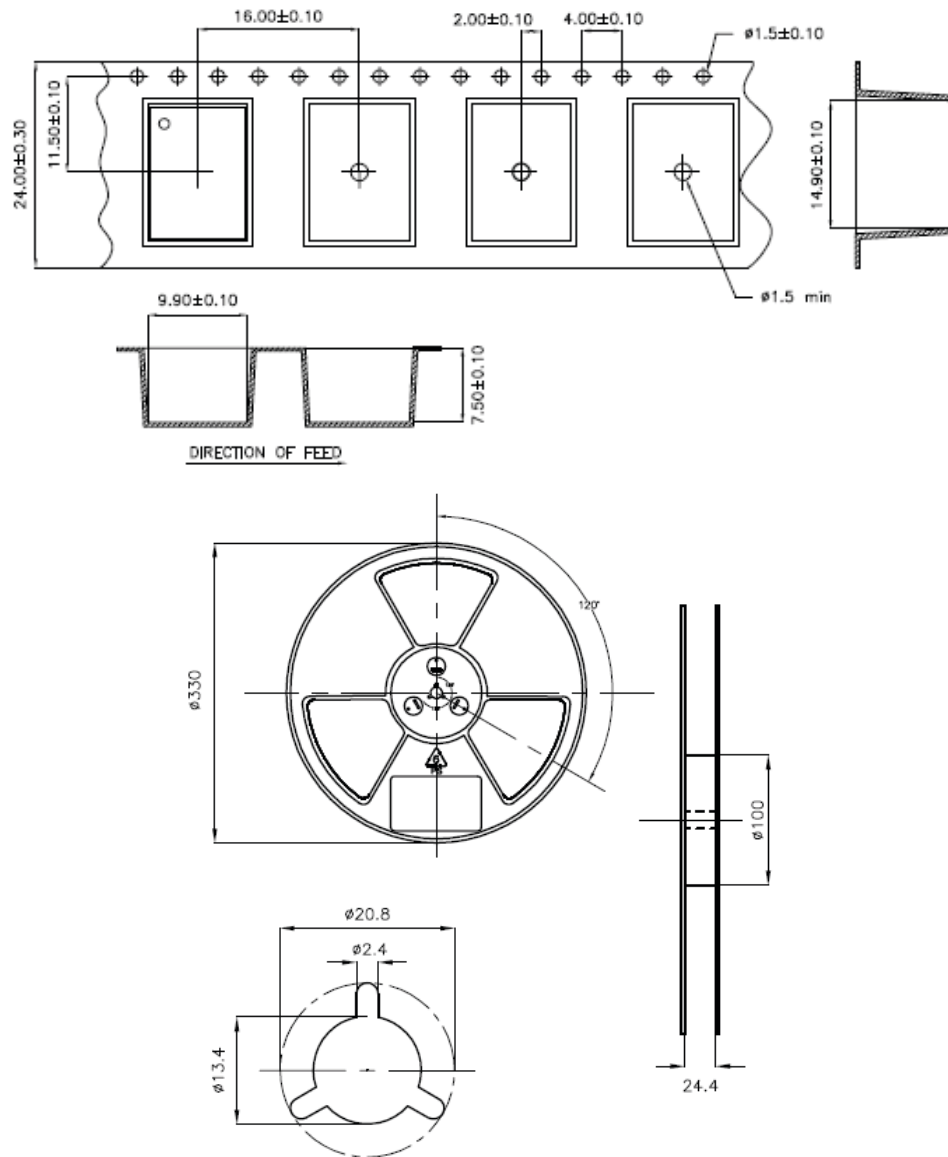
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RoHS/RoHS II Compliant  
MSL = 1

## Packaging [Note 10]

C = Cut Tape 50 units

T1 = Tape & Reel 100 units/reel

T5 = Tape & Reel 500 units/reel



Dimensions: mm

Note 10: 500 units = maximum quantity per 330mm reel

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