

# 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  $V_{\text{dd}}$  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

AOC1409



(1): Fixed Clock or Voltage Controlled
X: Fixed Clock
V: Voltage Controlled

(2): $V_{\text{dd}}$
A: 3.3V

(3): Stability over OTR
U: $\pm 10$ ppb over $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$

(4): RF Output
C: CMOS

(5): Output Frequency in MHz
Please specify the Frequency in units of MHz out to <b>4 digit</b> accuracy after the decimal. Example: “20.0000”=20MHz

(6): Packaging
Blank: Bulk
C: Cut/Tape 50 units
T1: Tape/Reel 100 units
T5: Tape/Reel 500 units

**Part Number Example:**  
AOC1409VAUC-20.0000C

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## 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%; (V <sub>c</sub> =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%; 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 (V <sub>c</sub> )		+1.65		V	Voltage-Controlled Option (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

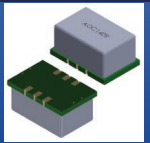


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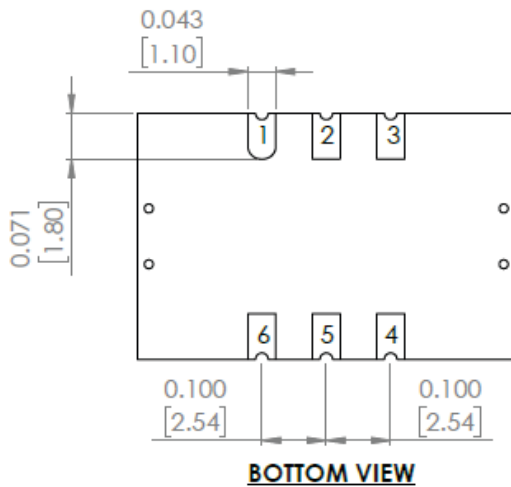
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## Mechanical Dimensions



## RECOMMENDED LAND PATTERN



Pin #	Function
#1	Option V: Voltage-Control (Vc) Option X: No Connect
#2	Do Not Connect (DNC) <sup>[Note 5]</sup>
#3	GROUND
#4	Output
#5	Do Not Connect (DNC) <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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## Recommended Reflow Profile <sup>[Note 6]</sup>



Zone	Description	Temperature	Time
1	Preheat / Soak	$T_{SMIN} \sim T_{SMAX}$ 150°C ~ 200°C	60 ~ 180 sec.
2	Reflow	$T_L$ 217°C	60 ~ 150 sec.
3	Peak heat	$T_P$ 260°C±5°C	20 ~ 40 sec.

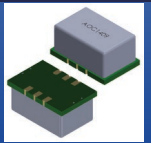
Note 6: Can withstand 2 times reflow; all temperatures refer to topside of the package, measured on the package body surface

Note 7: Ramp Up Rate ( $T_L \rightarrow T_P$ ) = 3°C / sec. MAX

Note 8: Ramp Down Rate ( $T_P \rightarrow T_L$ ) = 6°C / sec. MAX

Note 9: Time 25°C to Peak Temperature (25°C  $\rightarrow$   $T_P$ ) = 8 minutes MAX

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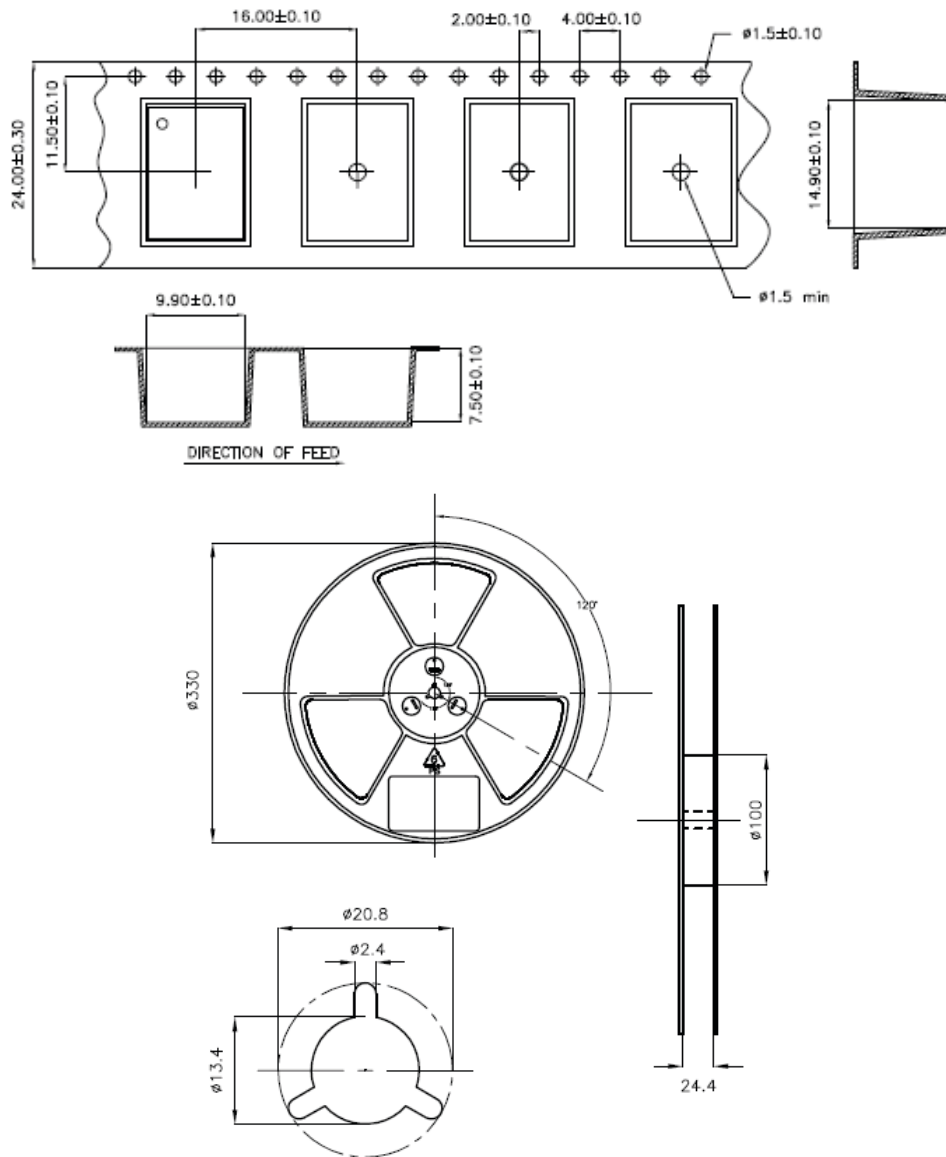
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## Packaging <sup>[Note 10]</sup>

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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