

# Model 334C

## Advanced PLL HCMOS VCXO



Part Dimensions:  
3.2 × 2.5 × 1.1mm • 24mg

### Features

- Ceramic Surface Mount Package
- Low Phase Jitter Performance, 600fs Typical
- Advanced PLL Design w/ Low Fundamental Crystal
- Frequency Range 10 – 250MHz \*
- +2.5V or +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-418

### Applications

- Broadcast Video Systems
- Storage Area Networking
- Broadband Access
- Phase-Locked Loop
- Networking Equipment
- Ethernet/GbE/SyncE
- Fiber Channel
- Test and Measurement

#### Standard Frequencies

- 50.00MHz
- 77.76MHz
- 100.00MHz
- 122.88MHz
- 125.00MHz
- 155.52MHz
- 156.25MHz
- 200.00MHz

\* See Page 7 for additional developed frequencies.  
Check with factory for availability of frequencies not listed.

### Description

CTS Model 334C is a low cost, high performance PLL voltage controlled oscillator supporting HCMOS output. Employing the latest IC technology, M334C has excellent stability and low phase jitter performance.

### Ordering Information

Model	Output Type	Frequency Code [MHz]	Absolute Pull Range	Frequency Stability	Temperature Range	Supply Voltage	Packaging
334	C	XXX or XXXX	B	3	I	3	T
	Code    Output C        HCMOS		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
		Code    Frequency Product Frequency Code <sup>1</sup>		Code    Stability 5        ±25ppm <sup>2</sup> 4        ±30ppm 3        ±50ppm		Code    Voltage 2        +2.5Vdc 3        +3.3Vdc	

#### Notes:

- 1) Refer to document 016-1454-0, Frequency Code Tables.  
3-digits for frequencies <100MHz, 4-digits for frequencies 100MHz or greater.
- 2) Check factory availability when paired with "I" temperature code.

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

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## Electrical Specifications

### Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Maximum Supply Voltage	$V_{CC}$	-	-0.5	-	4.0	V
Maximum Control Voltage	$V_C$	$V_{CC} = +2.5V$	-0.5	-	3.0	V
		$V_{CC} = +3.3V$	-0.5	-	3.8	V
Supply Voltage	$V_{CC}$	$\pm 5\%$	2.375	2.5	2.625	V
			3.135	3.3	3.465	
Supply Current	$I_{CC}$	Maximum Load	-	20	65	mA
Operating Temperature	$T_A$	-	-20	+25	+70	°C
			-40	-	+85	
Storage Temperature	$T_{STG}$	-	-55	-	+125	°C

### Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	$f_O$	-		10 - 250		MHz
Frequency Stability [Note 1]	$\Delta f/f_O$	-		25, 30 or 50		±ppm
Absolute Pull Range [Note 2]	APR	-	50	-	-	±ppm
Aging	$\Delta f/f_{25}$	First Year @ +25°C, nominal $V_{CC}$	-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  $f_O$  over variations in temperature, aging, power supply and load.

### Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Output Type	-	-		HCMOS		-
Output Load	$C_L$	-	-	-	15	pF
Output Voltage Levels	$V_{OH}$	CMOS Load	$0.9V_{CC}$	-	-	V
	$V_{OL}$		-	-	$0.1V_{CC}$	
Output Duty Cycle	SYM	@ 50% Level	45	-	55	%
Rise and Fall Time	$T_R, T_F$	@ 20%/80% Levels, $C_L = 15pF$	-	5	10	ns
Start Up Time	$T_S$	Application of $V_{CC}$	-	3	5	ms
<b>Enable Function [Tri-State]</b>						
Enable Input Voltage	$V_{IH}$	Pin 2 Logic '1', Output Enabled	$0.7V_{CC}$	-	-	V
Disable Input Voltage	$V_{IL}$	Pin 2 Logic '0', Output Disabled	-	-	$0.3V_{CC}$	V
Disable Current	$I_{IL}$	Pin 2 Logic '0', Output Disabled	-	16	22	mA
Enable Time	$T_{PLZ}$	Pin 2 Logic '1', Output Enabled	-	-	200	ns
Phase Jitter, RMS	$t_{jrms}$	Bandwidth 12 kHz - 20 MHz	-	600	<1000	fs
Period Jitter, RMS	$p_{jrms}$	-	-	3.0	-	ps
Period Jitter, pk-pk	$p_{jpk-pk}$	-	-	30	-	ps

## Electrical Specifications

### Control Voltage

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Control Voltage	$V_C$	$V_{CC} = 2.5V$	0.2	1.25	2.3	V
		$V_{CC} = 3.3V$	0.3	1.65	3.0	
Frequency Deviation	$\Delta f/f_0$	$V_C = 0.2V$	-60 to -180		ppm	
		$V_C = 2.3V$	60 to 180			
		$V_C = 0.3V$	-60 to -180		ppm	
		$V_C = 3.0V$	60 to 180			
Linearity	L	Best Straight Line Fit	-	-	±15	%
Gain Transfer	$K_V$	Pull Sensitivity; @ +1.25V, +25°C	-	80	260	ppm/V
		Pull Sensitivity; @ +1.65V, +25°C	-	-	-	
Input Impedance	$Z_{Vc}$	-	1	-	-	MOhms
Modulation Roll-off	-	@ -3dB	10	-	-	kHz
Transfer Function	-	-	-	Positive	-	-

### Enable Truth Table

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

### Test Circuit

HCMOS



### Output Waveform

HCMOS





## Electrical Specifications

### Performance Data

#### Phase Noise [typical]

125MHz, HCMOS,  $V_{CC} = +3.3V$ ,  $V_C = +1.65V$ ,  $T_A = +25^\circ C$



#### Phase Noise Tabulated

125MHz, HCMOS,  $V_{CC} = +3.3V$ ,  $V_C = +1.65V$ ,  $T_A = +25^\circ C$

PARAMETER	SYMBOL	CONDITIONS	TYP	UNIT
<b>HCMOS @ 125.00MHz</b>				
Phase Noise		Single Side Band		
		@ 10Hz	-57.8277	
		@ 100Hz	-83.0438	
		@ 1kHz	-107.5582	
		@ 10kHz	-124.0745	dBc/Hz
		@ 100kHz	-127.7532	
		@ 1MHz	-139.0681	
		@ 10MHz	-156.3500	
	@ 20MHz	-157.3626		
Phase Jitter, RMS	tjrms	Integration Bandwidth 12kHz - 20MHz	530.5330	fs

## Mechanical Specifications

### Package Drawing



### Marking Information

1. O – Output Type; C = HCMOS.
  2. ST – Frequency Stability/Temperature Code. [Refer to Ordering Information]
  3. V – Voltage Code; 3 = 3.3V, 2 = 2.5V.
  4. D – Date Code. See Table I for codes.
  5. xxxx – Frequency Code.  
3-digits, frequencies below 100MHz  
4-digits, frequencies 100MHz or greater
- [See document 016-1454-0, Frequency Code Tables.]

### Recommended Pad Layout



### Notes

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

### Pin Assignments

Pin	Symbol	Function
1	V <sub>C</sub>	Voltage Control
2	EOH	Enable [tri-state]
3	GND	Circuit & Package Ground
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 minimum and 3k pieces maximum per 180mm reel.
2. Complete CTS part number, frequency value and date code information must appear on reel and carton labels.



## Addendum

### Additional Developed Frequencies – MHz

FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE
25.000000	250	150.000000	1500				
62.500000	625	153.600000	1536				
106.250000	1062	250.000000	2500				
132.000000	1320						
148.500000	1485						

### Frequency Codes for Cover Page Table – MHz

FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE
50.000000	500	155.520000	1555
77.760000	777	156.250000	1562
100.000000	1000	200.000000	2000
122.880000	1228		
125.000000	1250		