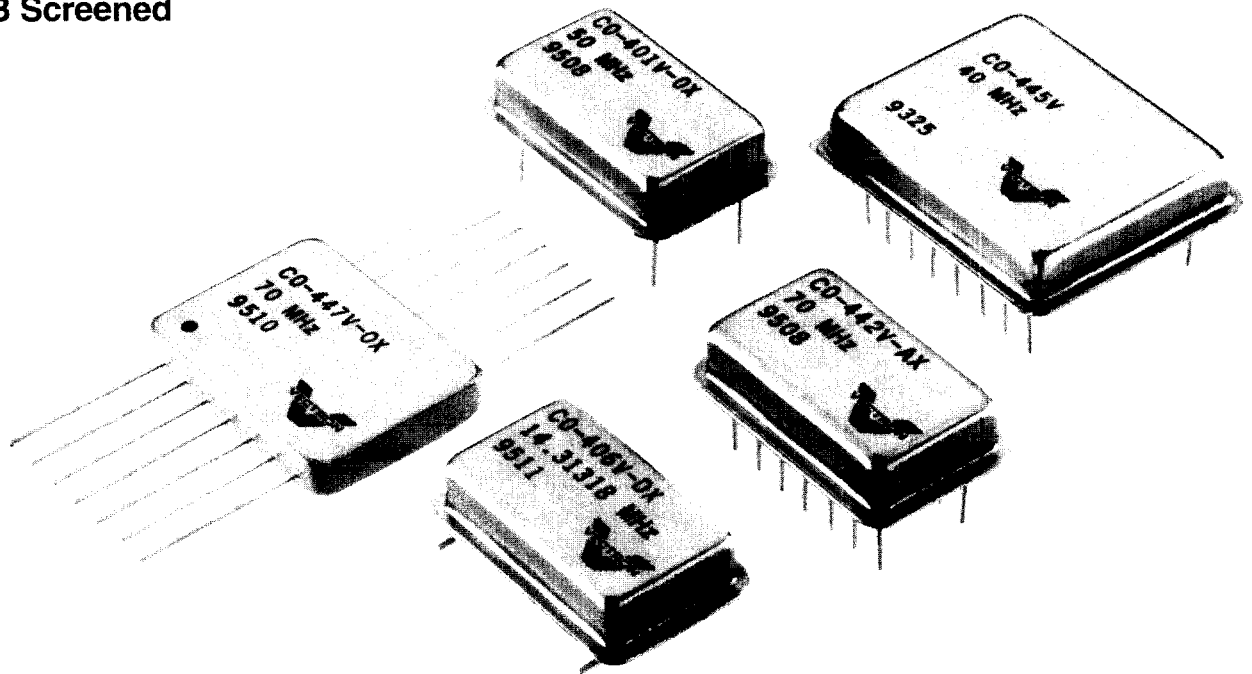


VECTRON **VCXOs** *Voltage Controlled Crystal Oscillators* **for Phase Locking Applications**

(See pages 75-78 for linear and wide deviation VCXOs)

FEATURES

- Deviation of ± 30 ppm to ± 500 ppm
- Broad product range
 - TTL: 32 kHz – 70 MHz
 - HCMOS: 64 kHz – 70 MHz
 - ECL: 8 MHz – 640 MHz
 - Sine: 8 MHz – 1200 MHz
- PC board mount, low profile
DIP, and chassis mount RF
connector configurations
- DIP models available
Class B Screened



VCXOs

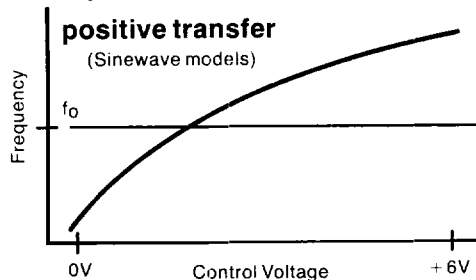
8 MHz to 1200 MHz - Sinewave output



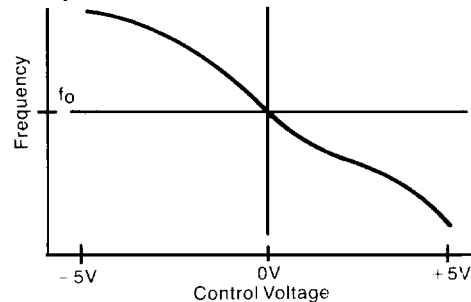
SINEWAVE

Configuration	PC board mount		Chassis mount with rf output connector		Low profile hybrid DIP and flatpack
Series	(a) CO-233V (b) CO-233VH	(a) CO-233VF (b) CO-286VP	CO-233VFW	CO-286VW CO-283VW	CO-484V CO-487V
Center Frequency	(a) 8-149.9 MHz (b) 150-200 MHz	(a) 8-400 MHz (b) 400.1-1200 MHz	8-400 MHz	400.1-1200 MHz	8-200 MHz
Output Level	0.5 Vrms/50Ω (+7 dBm); Option "R": +13 dBm (not available in CO-484V/487V above 140 MHz or CO-233VF/VFW above 280 MHz). Harmonics are -20 dBc. Harmonic and subharmonic levels can be reduced to -30 dBc or -40 dBc in all models except CO-233V and CO-233VH. +20 dBm optional in CO-283VW.				
Supply (± 5%)	+15 Vdc (+12 Vdc to +24 Vdc optional); current ranges from 15 mA at 8 MHz to 100 mA at 1200 MHz				
Deviation/Stability Alternatives	Code	Temperature Range	Temperature Stability	*Minimum Deviation	See Page 74 for constructing Model Number * Deviation is referenced to the specified output frequency. For example, in Model CO-484V-AX at 100 MHz, at 25°C and 0V control the frequency is at least 50 ppm below 100 MHz and at +6V the frequency is at least 50 ppm above 100 MHz. ** The following notes apply to options C, F, I, L, and N (± 200 ppm deviation) • They are only available at frequencies up to 75 MHz • Linearity of ± 10% is standard
	D	0/+50°C	± 10 ppm	± 30 ppm	
	A	0/+50°C	± 20 ppm	± 50 ppm	
	B	0/+50°C	± 35 ppm	± 100 ppm	
	C**	0/+50°C	± 35 ppm	± 200 ppm	
	D	0/+70°C	± 20 ppm	± 40 ppm	
	E	0/+70°C	± 40 ppm	± 100 ppm	
	F**	0/+70°C	± 40 ppm	± 200 ppm	
	G	-20/+70°C	± 30 ppm	± 60 ppm	
	H	-20/+70°C	± 40 ppm	± 100 ppm	
	I**	-20/+70°C	± 40 ppm	± 200 ppm	
	J	-40/+85°C	± 40 ppm	± 60 ppm	
	K	-40/+85°C	± 50 ppm	± 100 ppm	
	L**	-40/+85°C	± 50 ppm	± 200 ppm	
	M	-55/+85°C	± 50 ppm	± 100 ppm	
	N**	-55/+85°C	± 50 ppm	± 200 ppm	
Control Voltage	0 to +6V positive transfer function (lowest frequency at 0V) * ± 3V to ± 10V optional except for CO-286V *(With bipolar control voltage, transfer function is negative, linearity is ± 10%.)				
Linearity	± 20%, smooth monotonic characteristic (± 10% linearity available) ± 10% is standard with bipolar control voltage and with deviation/stability options C, F, I, L, and N.				
Modulation Rate	dc to 1 kHz; higher modulation rates available				
Modulation Input Z	Greater than 50 kΩ				
Aging Rate	Hybrid models: 3-5 ppm for first year, then 2 ppm/year thereafter—less than 20 ppm total over 10 years. Other Models: 5 ppm for first year, then 3 ppm/year thereafter. Option "Y": 2 ppm for first year, 1 ppm/year thereafter.				
Mechanical Tuning Option	"T"	"T"	"T"	"T"	N/A
	"T" indicates that a mechanical tuning option is available; add "T" to model number				
Size (See drawings on page 74)	1 1/2" x 1 1/2" x 5/8" CO-233V & VH differ in pin configuration	CO-233VF: 2" x 2" x 3/4" CO-286VP: 1" x 2" x 0.6"	2" x 2" x 3/4"	CO-286VW: 1" x 2" x 0.6" CO-283VW: 2" x 3" x 3/4"	CO-484: (16 pin double DIP) 0.8" x 0.98" x 0.2" CO-487: (Flatpack) 1.0" x 1.0" x 0.17"
How to Order	see page 74				

Unipolar Control — positive transfer

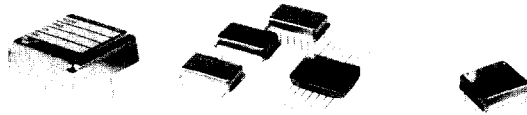


Bipolar Control — negative transfer



VCXOs – 32 kHz to 70 MHz

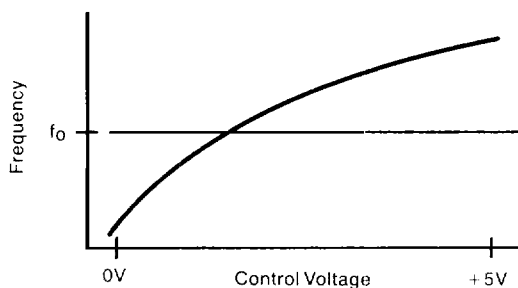
Now available in European CO-15 package to 77 MHz. (0.8" x 0.8" x 0.5" - 20.3 x 20.3 x 12.7 mm) Contact factory for details



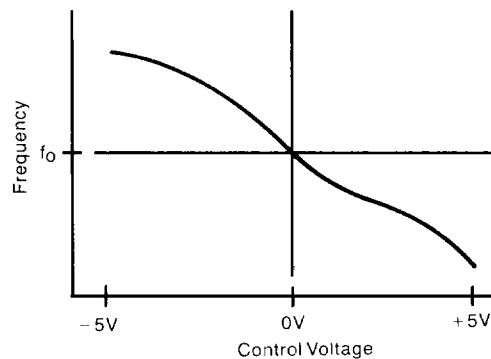
		TTL																																																																		
Series	(a) CO-231V (b) CO-231VH PC Board Mount	CO-401V: 4 Pin Dip CO-402V: 14 Pin Dip CO-406V: Surface Mount CO-407V: Flatpack Low Profile Hybrid Models																																																																		
Center Frequency	(a) 32 kHz-25 MHz (b) 25.1-70 MHz	32 kHz-70 MHz																																																																		
Output Level	drives 10 TTL loads via TTL or AC MOS gate depending on frequency and temperature range																																																																			
Supply (± 5%)	+5 Vdc at 20-60 mA, depending on frequency																																																																			
Deviation/Stability Alternatives	<table border="1"> <thead> <tr> <th>Code</th> <th>Temperature Range</th> <th>Temperature Stability</th> <th>*Minimum Deviation</th> </tr> </thead> <tbody> <tr><td>O</td><td>0/+50°C</td><td>± 10 ppm</td><td>± 30 ppm</td></tr> <tr><td>A</td><td>0/+50°C</td><td>± 20 ppm</td><td>± 50 ppm</td></tr> <tr><td>B</td><td>0/+50°C</td><td>± 35 ppm</td><td>± 100 ppm</td></tr> <tr><td>C**</td><td>0/+50°C</td><td>± 35 ppm</td><td>± 200 ppm</td></tr> <tr><td>D</td><td>0/-70°C</td><td>± 20 ppm</td><td>± 40 ppm</td></tr> <tr><td>E</td><td>0/-70°C</td><td>± 40 ppm</td><td>± 100 ppm</td></tr> <tr><td>F**</td><td>0/-70°C</td><td>± 40 ppm</td><td>± 200 ppm</td></tr> <tr><td>G</td><td>-20/+70°C</td><td>± 30 ppm</td><td>± 60 ppm</td></tr> <tr><td>H</td><td>-20/+70°C</td><td>± 40 ppm</td><td>± 100 ppm</td></tr> <tr><td>I**</td><td>-20/+70°C</td><td>± 40 ppm</td><td>± 200 ppm</td></tr> <tr><td>J</td><td>-40/+85°C</td><td>± 40 ppm</td><td>± 60 ppm</td></tr> <tr><td>K</td><td>-40/+85°C</td><td>± 50 ppm</td><td>± 100 ppm</td></tr> <tr><td>L**</td><td>-40/+85°C</td><td>± 50 ppm</td><td>± 200 ppm</td></tr> <tr><td>M</td><td>-55/+85°C</td><td>± 50 ppm</td><td>± 100 ppm</td></tr> <tr><td>N**</td><td>-55/+85°C</td><td>± 50 ppm</td><td>± 200 ppm</td></tr> </tbody> </table>	Code	Temperature Range	Temperature Stability	*Minimum Deviation	O	0/+50°C	± 10 ppm	± 30 ppm	A	0/+50°C	± 20 ppm	± 50 ppm	B	0/+50°C	± 35 ppm	± 100 ppm	C**	0/+50°C	± 35 ppm	± 200 ppm	D	0/-70°C	± 20 ppm	± 40 ppm	E	0/-70°C	± 40 ppm	± 100 ppm	F**	0/-70°C	± 40 ppm	± 200 ppm	G	-20/+70°C	± 30 ppm	± 60 ppm	H	-20/+70°C	± 40 ppm	± 100 ppm	I**	-20/+70°C	± 40 ppm	± 200 ppm	J	-40/+85°C	± 40 ppm	± 60 ppm	K	-40/+85°C	± 50 ppm	± 100 ppm	L**	-40/+85°C	± 50 ppm	± 200 ppm	M	-55/+85°C	± 50 ppm	± 100 ppm	N**	-55/+85°C	± 50 ppm	± 200 ppm	See Page 74 for constructing Model Number *Deviation is referenced to the specified output frequency. For example, in Model CO-401V-BX at 10 MHz, at 25°C and 0V control the frequency is at least 100 ppm below 10 MHz and at +5V the frequency is at least 100 ppm above 10 MHz. **The following notes apply to options C, F, I, L, and N (± 200 ppm deviation) • They are only available at frequencies up to 25 MHz • Linearity of ± 10% is standard (± 5% and ± 2% optional) • Model CO-231V, which is normally packaged in a 1.5" x 1.5" x 0.5" metal can with epoxy base, requires a metal base which increases height to 5/8"; pin diameter is then .030".		
Code	Temperature Range	Temperature Stability	*Minimum Deviation																																																																	
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N**	-55/+85°C	± 50 ppm	± 200 ppm																																																																	
Control Voltage and Linearity	0 to +5V. Positive transfer function (lowest frequency at 0V) ± 20% linearity is standard, ± 10% optionally available (standard for C, F, I, L, and N deviation codes)	0 to +5V. Positive transfer function (lowest frequency at 0V). ± 20% linearity is standard, ± 10% optionally available (standard for C, F, I, L, and N deviation codes) ± 5V Bipolar control voltage is optional (± 3V to ± 10V also available on special order). With bipolar control, transfer function is negative, and standard linearity is ± 10% (with ± 5% optional).																																																																		
Modulation Rate	dc to 1 kHz; higher modulation rates optional																																																																			
Modulation Input Z	Greater than 50 kΩ																																																																			
Aging Rate	Hybrid models: 3-5 ppm for first year, then 2 ppm/year thereafter—less than 20 ppm total over 10 years. CO-231V(VH): 5 ppm for first year, then 3 ppm/year thereafter. Option "Y": 2 ppm for first year, 1 ppm/year thereafter.																																																																			
Mechanical Tuning Option	Add "T" to model number	N/A																																																																		
Size (See drawings on page 74)	(a) CO-231V 1 1/2" x 1 1/2" x 1/2" (38 x 38 x 12.7 mm) (b) CO-231VH 1 5/8" x 1 5/8" x 1/2" (41.3 x 41.3 x 12.7 mm)	CO-401V: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-402V: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-406V: 0.5" x 0.8" x 0.25" (12.7 x 20.3 x 6.4 mm) CO-407V: 0.6" x 0.8" x 0.17" (15.3 x 20.3 x 4.2 mm)																																																																		

VCXO CHARACTERISTICS

Unipolar Control — positive transfer



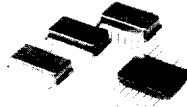
Bipolar Control — negative transfer



VCXOs 64 kHz to 640 MHz

FEATURES:

- Low Profile Hybrid VCXOs to 640 MHz
- Deviation as wide as ± 500 ppm



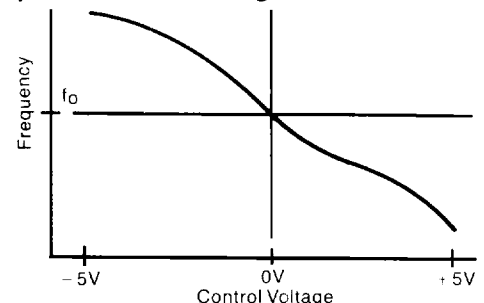
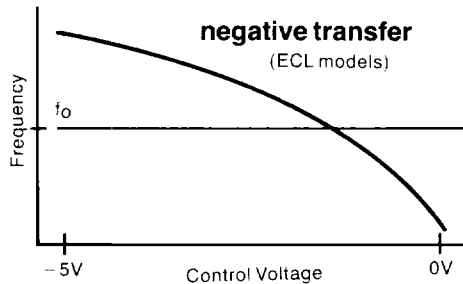
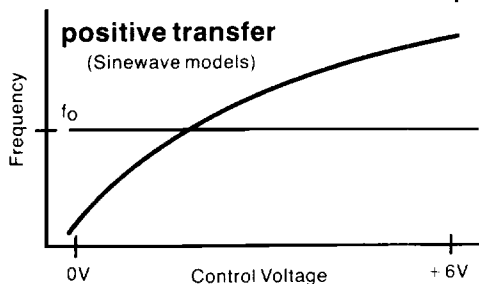
ECL VCXOs
Now available in European CO-08 package to 200 MHz

	HCMOS	HCMOS/ACMOS	ECL																																																																																																													
Series	CO-445V 16 pin Double DIP <i>Very wide deviation</i>	CO-441V: 4 Pin Dip CO-442V: 14 Pin Dip CO-446V: Surface Mount CO-447V: Flatpack	CO-434V: 16 pin DDIP *CO-434VH: 24 pin DDIP CO-437V: Flatpack	CO-454V: 16 pin DDIP *CO-454VH: 24 pin DDIP CO-457V: Flatpack																																																																																																												
Center Frequency	100 kHz to 50 MHz	64 kHz-70 MHz	8-200 MHz *200.1-640 MHz	8-200 MHz *200.1-640 MHz																																																																																																												
Output Level	HCMOS, drives 3 TTL loads	HCMOS/ACMOS compatible	10K, 10KH, MECLIII, ECLinPS 10E or 10EL Complementary output is standard in CO-434VH and CO-454VH; optional in other models	100K ECLinPS, 100E or 100 EL																																																																																																												
Supply ($\pm 5\%$)	+5 Vdc, <25 mA	+5 Vdc at 20-60 mA, depending on frequency	-5.2 Vdc	-4.5 Vdc																																																																																																												
Deviation/Stability Alternatives	<table border="1"> <thead> <tr> <th>Code</th> <th>Range</th> <th>Temperature Stab. at to</th> <th>Deviation Range</th> </tr> </thead> <tbody> <tr><td>EB15</td><td>0 to +50°C</td><td>± 10 ppm</td><td>± 250 ppm</td></tr> <tr><td>FB25</td><td>0 to +50°C</td><td>± 20 ppm</td><td>± 500 ppm</td></tr> <tr><td>EC25</td><td>0 to +70°C</td><td>± 20 ppm</td><td>± 250 ppm</td></tr> <tr><td>FC45</td><td>0 to +70°C</td><td>± 40 ppm</td><td>± 500 ppm</td></tr> <tr><td>ED35</td><td>-20 to +70°C</td><td>± 30 ppm</td><td>± 250 ppm</td></tr> <tr><td>FD45</td><td>-20 to +70°C</td><td>± 40 ppm</td><td>± 500 ppm</td></tr> <tr><td>EE45</td><td>-40 to +85°C</td><td>± 40 ppm</td><td>± 250 ppm</td></tr> <tr><td>FE55</td><td>-40 to +85°C</td><td>± 50 ppm</td><td>± 500 ppm</td></tr> <tr><td>EF55</td><td>-55 to +85°C</td><td>± 50 ppm</td><td>± 250 ppm</td></tr> <tr><td>FF55</td><td>-55 to +85°C</td><td>± 50 ppm</td><td>± 500 ppm</td></tr> </tbody> </table> <p>NOTE: When internal multiplication is used (generally above 25 MHz) sub-harmonic suppression is >30 dBc.</p>	Code	Range	Temperature Stab. at to	Deviation Range	EB15	0 to +50°C	± 10 ppm	± 250 ppm	FB25	0 to +50°C	± 20 ppm	± 500 ppm	EC25	0 to +70°C	± 20 ppm	± 250 ppm	FC45	0 to +70°C	± 40 ppm	± 500 ppm	ED35	-20 to +70°C	± 30 ppm	± 250 ppm	FD45	-20 to +70°C	± 40 ppm	± 500 ppm	EE45	-40 to +85°C	± 40 ppm	± 250 ppm	FE55	-40 to +85°C	± 50 ppm	± 500 ppm	EF55	-55 to +85°C	± 50 ppm	± 250 ppm	FF55	-55 to +85°C	± 50 ppm	± 500 ppm	<table border="1"> <thead> <tr> <th>Code</th> <th>Temperature Range</th> <th>Temperature Stability</th> <th>*Minimum Deviation</th> </tr> </thead> <tbody> <tr><td>O</td><td>0/+50°C</td><td>± 10 ppm</td><td>± 30 ppm</td></tr> <tr><td>A</td><td>0/+50°C</td><td>± 20 ppm</td><td>± 50 ppm</td></tr> <tr><td>B</td><td>0/+50°C</td><td>± 35 ppm</td><td>± 100 ppm</td></tr> <tr><td>C**</td><td>0/+50°C</td><td>± 35 ppm</td><td>± 200 ppm</td></tr> <tr><td>D</td><td>0/+70°C</td><td>± 20 ppm</td><td>± 40 ppm</td></tr> <tr><td>E</td><td>0/+70°C</td><td>± 40 ppm</td><td>± 100 ppm</td></tr> <tr><td>F**</td><td>0/+70°C</td><td>± 40 ppm</td><td>± 200 ppm</td></tr> <tr><td>G</td><td>-20/+70°C</td><td>± 30 ppm</td><td>± 60 ppm</td></tr> <tr><td>H</td><td>-20/+70°C</td><td>± 40 ppm</td><td>± 100 ppm</td></tr> <tr><td>I**</td><td>-20/+70°C</td><td>± 40 ppm</td><td>± 200 ppm</td></tr> <tr><td>J</td><td>-40/+85°C</td><td>± 40 ppm</td><td>± 60 ppm</td></tr> <tr><td>K</td><td>-40/+85°C</td><td>± 50 ppm</td><td>± 100 ppm</td></tr> <tr><td>L**</td><td>-40/+85°C</td><td>± 50 ppm</td><td>± 200 ppm</td></tr> <tr><td>M</td><td>-55/+85°C</td><td>± 50 ppm</td><td>± 100 ppm</td></tr> <tr><td>N**</td><td>-55/+85°C</td><td>± 50 ppm</td><td>± 200 ppm</td></tr> </tbody> </table>	Code	Temperature Range	Temperature Stability	*Minimum Deviation	O	0/+50°C	± 10 ppm	± 30 ppm	A	0/+50°C	± 20 ppm	± 50 ppm	B	0/+50°C	± 35 ppm	± 100 ppm	C**	0/+50°C	± 35 ppm	± 200 ppm	D	0/+70°C	± 20 ppm	± 40 ppm	E	0/+70°C	± 40 ppm	± 100 ppm	F**	0/+70°C	± 40 ppm	± 200 ppm	G	-20/+70°C	± 30 ppm	± 60 ppm	H	-20/+70°C	± 40 ppm	± 100 ppm	I**	-20/+70°C	± 40 ppm	± 200 ppm	J	-40/+85°C	± 40 ppm	± 60 ppm	K	-40/+85°C	± 50 ppm	± 100 ppm	L**	-40/+85°C	± 50 ppm	± 200 ppm	M	-55/+85°C	± 50 ppm	± 100 ppm	N**	-55/+85°C	± 50 ppm	± 200 ppm	<p>See Page 74 for constructing Model Number</p> <p>* Deviation is referenced to the specified output frequency. For example, in Model CO-441V-BX at 10 MHz, at 25°C and 0V control the frequency is at least 100 ppm below 10 MHz and at +5V the frequency is at least 100 ppm above 10 MHz.</p> <p>** The following notes apply to options C, F, I, L, and N (± 200 ppm deviation) They are only available at frequencies up to 25 MHz for HCMOS/ACMOS and 75 MHz for ECL. Linearity of $\pm 10\%$ is standard. ($\pm 5\%$ and $\pm 2\%$ optional for HCMOS and ACMOS models)</p>	
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Control Voltage and Linearity	0 to +5 Vdc Positive transfer (lowest frequency at 0V) $\pm 20\%$ linearity smooth monotonic characteristic ($\pm 10\%$ linearity available)	0 to +5V; positive transfer function (lowest frequency at 0V) $\pm 20\%$ linearity is standard, $\pm 10\%$ optionally available (standard for C, F, I, L, and N deviation codes). ± 5 V bipolar control voltage is optional (± 3 V to ± 10 V available) With Bipolar, transfer function is negative, standard linearity is $\pm 10\%$ ($\pm 5\%$ optional).	0 to -5V (lowest frequency at 0V); ± 3 V to ± 10 V optional*. $\pm 20\%$, smooth monotonic characteristic ($\pm 10\%$ linearity available). $\pm 10\%$ is standard with bipolar control voltage and with deviation/stability options C, F, I, L, and N. *With bipolar control voltage, transfer function is negative, and an additional +12 to +24V supply is required.																																																																																																													
Modulation Rate	0 to 10 kHz (Higher modulation rates available)	dc to 1 kHz; higher modulation rates optional																																																																																																														
Modulation Input Z	Greater than 50 k Ω	Greater than 50 k Ω																																																																																																														
Aging Rate	3-5 ppm first year, then 2 ppm/year thereafter—less than 20 ppm total over 10 years.																																																																																																															
Size (See drawings on page 74)	0.8" x 0.98" x 0.38" (20.3 x 24.9 x 9.7 mm) Resistance welded 16 pin double DIP. Mechanical package same as CO-484V (see pg 74) except height is 0.38"	CO-441V: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-442V: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-446V: 0.5" x 0.8" x 0.25" (12.7 x 20.3 x 6.4 mm) CO-447V: 0.6" x 0.8" x 0.17" (15.3 x 20.3 x 4.2 mm)	CO-434V, CO-454V: 0.8" x 0.98" x 0.2" (20.3 x 24.9 x 5.1 mm) (16 pin double DIP) CO-437V, CO-457V: 1" x 1" x 0.17" (25.4 x 25.4 x 4.3 mm) (flatpack) CO-434VH, CO-454VH: 0.8" x 1.4" x 0.2" (21 x 36 x 5.1 mm) (24 pin double DIP)																																																																																																													

VCXO CHARACTERISTICS

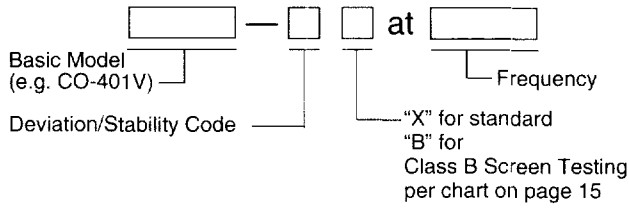
Unipolar Control

Bipolar Control—negative transfer

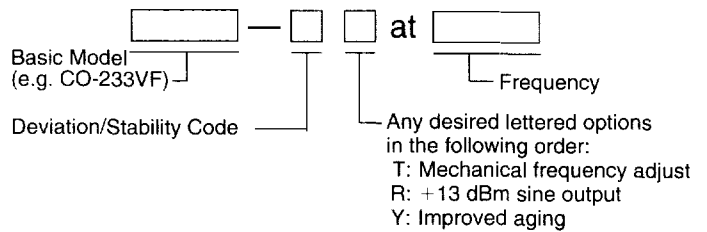


HOW TO SPECIFY

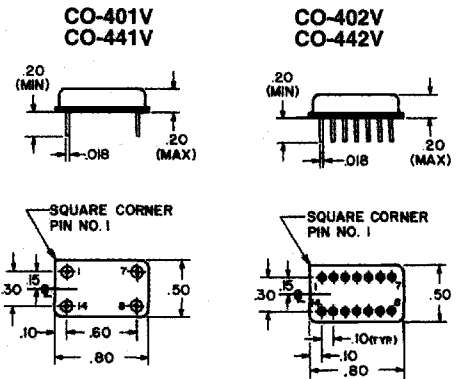
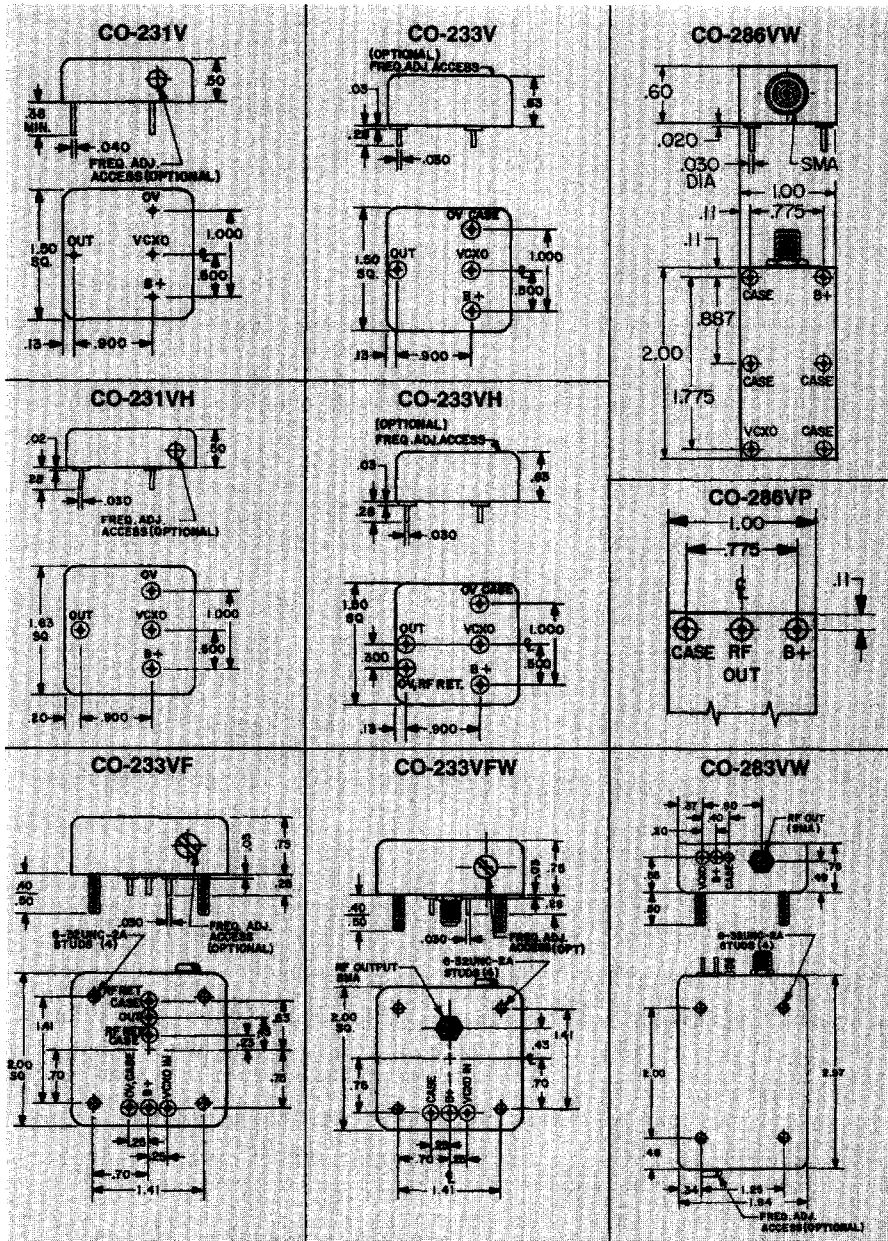
Hybrid DIP Models



PCB and Chassis Mount Models



OUTLINE/INSTALLATION DRAWINGS

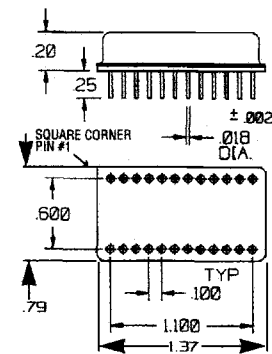


Available with insulated standoffs; increases height to 0.23" maximum

Pin	Function
1	VCXO
7	OV, Case
8	Output
14	+5 Vdc

CO-406V, CO-446V: See CO-406 drawing on page 16. Pin connections at left apply.
CO-407V, CO-447V: See CO-407 drawing on page 16. Pin connections at left apply.

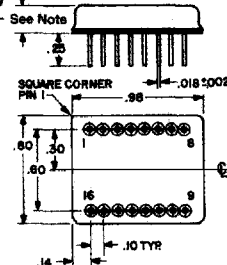
CO-434VH/454VH



CO-484V CO-434V CO-454V CO-445V

Pin	Function	
	CO-445V CO-484V	*CO-434V *CO-454V
6	VCXO	VCXO
8	OV, Case	-5.2 Vdc/-4.5 Vdc
9	Output	Output
16	Supply (+)	OV, Case

CO-484V: .20"
CO-434V: .20"
CO-454V: .20"
CO-445V: .38"



PIN	FUNCTION
5	VCXO INPUT
12	SUPPLY (-)
13	RF OUTPUT Q
14	RF OUTPUT D
15	RF RETURN, CASE
24	OV, CASE
OTHERS	DO NOT USE*

*PIN MAY BE USED INTERNALLY

* For complementary output option, Q is on pin 10.
** Unlisted pins may be used internally

Markings do not appear on oscillators; they are for reference only. Dimensions are in inches. Case dimension tolerances are ± .02"