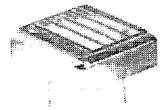





Series	DIP AND SURFACE MOUNT HYBRIDS **CO-401:** 4 PIN DIP ●**CO-402:** 14 PIN DIP **CO-406:** SURFACE MOUNT **CO-407:** FLATPACK	LCC **CO-408**	PCB MOUNT **CO-231/CO-231H** to 100 MHz Packaged Crystal for best temperature stability Mechanical tuning available Best aging available	14 PIN DIP **CO-238** Packaged Crystal for best temperature stability Mechanical tuning available Best aging available
Features	*Low profile resistance/seam welded ruggedized designs*	*Smallest size Lowest profile*	*Broadest range of frequencies and options*	*Best stability options in DIP package*
ELECTRICAL **Frequency**	16 kHz-100 MHz	1 MHz-60 MHz	**CO-231:** 1 Hz-75 MHz **CO-231H:** 75.01-100 MHz	16 KHz- 70 MHz
Accuracy (maximum error at 25°C)	**CO-40☐A:** ±50 ppm **CO-40☐C:** ±25 ppm **CO-40☐D:** ±15 ppm **CO-40☐B:** ±10 ppm ***CO-40☐E:** ±1 ppm ▲ 1 for 4 pin DIP 2 for 14 pin DIP 6 for surface mount 7 for flatpack *Settability via external capacitor; 16 kHz-60 MHz only. (See page 16 for pin connections.)	**CO-408A:** ±50 ppm **CO-408C:** ±25 ppm	**CO-231:** ±10 ppm ***CO-231T:** ±1 ppm **CO-231H:** ±10 ppm ***CO-231HT:** ±1 ppm *"T" option includes tuning adjustment with nominal range of ±30 ppm below 25 MHz and ±5 ppm above 25 MHz.	**CO-238A:** ±50 ppm **CO-238C:** ±25 ppm **CO-238D:** ±15 ppm **CO-238B:** ±10 ppm ***CO-238T:** ±1ppm *(16 kHz-30 MHz only)

●Available as QPL to MIL-O-55310/16B&S

Temperature Stability

STANDARD:	0°C	to	+70°C:	±25 ppm	
Option **1**:	−55°C	to	+85°C:	±50 ppm	
Option **2**:	−55°C	to	+125°C:	±50 ppm	
Option **3**:	0°C	to	+50°C:	±3 ppm	(N/A in CO-400 Series)
Option **4**:	0°C	to	+50°C:	±1 ppm	(only for CO-231, 12 kHz-20 MHz)
Option **5**:	0°C	to	+50°C:	±5 ppm	
Option **6**:	0°C	to	+50°C:	±10 ppm	
Option **7**:	−55°C	to	+125°C:	±100 ppm	
*Option **9**:	−55°C	to	+200°C:	±300 ppm	(only for CO-401/2/6/7 series in 4-20 MHz range)

*Specified stability includes initial accuracy: do not specify A, B, C, D or E accuracy

Improved accuracy/stability available on some models to, for example, fo ±7 ppm over 0°C to +50°C and fo ±10 ppm over 0°C to +70°C. Improvement also available over wider temperature ranges. Please contact factory.

Aging Rate (typically after initial 30 days)	3 ppm first year 2 ppm/year thereafter		Standard: 5 ppm first year, 3 ppm/ year thereafter Option "**Y**": 1-2 ppm first year, 1 ppm/year thereafter	
Supply	5 Vdc ± 5% <4 MHz: <90 mA 4-20 MHz: <30 mA >20 MHz: <65 mA	5 Vdc ± 5% <12.5 MHz: <70 mA ≥12.5 MHz: <50 mA	5 Vdc ± 5% <4 MHz: <90 mA 4-20 MHz: <30 mA >20 MHz: <65 mA	

Output

	<4 MHz	4-20 MHz	>20 MHz	<12.5 MHz	≥12.5 MHz	<4 MHz	4-20 MHz	>20 MHz
Drive	10 TTL	10 TTL	10 STTL	10 TTL	10 STTL	10 TTL	10 TTL	10 STTL
"0" Level	<0.4V	<0.4V	<0.4V	<0.4V	<0.4V	<0.4V	<0.4V	<0.4V
"1" Level	>2.4V	>2.4V	>2.4V	>2.4V	>2.4V	>2.4V	>2.4V	>2.4V
Rise/Fall Time	<15ns	<15ns	2-5ns	<15ns	2-5ns	<15ns	<15ns	2-5ns
(0.5-2.4V)								
Symmetry @ 1.5V	55/45	60/40	60/40	55/45	60/40	55/45	65/35	65/35

If improved symmetry is required, please contact factory

*Drives 2 STTL above 50 MHz

MECHANICAL **Size** (see drawings on page 16)	†CO-401: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-402: 0.5" x 0.8" x 0.2" (12.7 x 20.3 x 5.1 mm) CO-406: 0.5" x 0.8" x 0.25" (12.7 x 20.3 x 6.4 mm) ††CO-407: 0.6" x 0.8" x 0.17" (15.3 x 20.3 x 4.2 mm) ††0.12" (3.1mm) height available <20 MHz	0.480" x 0.480" x 0.085" (12.2 x 12.2 x 2.2 mm)	1.5" x 1.5" x 0.5" (38 x 38 x 12.7 mm)	0.5" x 0.8" x 0.35" (12.7 x 20.3 x 8.9 mm)
Case	Resistance or seamwelded metal case †CO-401 Series available with insulated standoffs; height increases to 0.23" (5.8 mm)	Sealed ceramic leadless chip carrier	Metal can, epoxy or metal base "**C**" option: solder sealed metal case, height 0.68" (17.3 mm)	Epoxy Case

ENVIRONMENTAL **Vibration**	20 g to 2 kHz sine per MIL-STD-202, Method 204, Condition D. 20 grms to 2 kHz random per MIL-STD-202, Method 214, Condition I-F.	Standard: 5g to 500 Hz Optional: 20 g to 2 kHz sine per MIL-STD-202, Method 204, Condition D. 20 grms to 2 kHz random per MIL-STD-202, Method 214, Condition I-F.
Shock	100 g 6 ms per MIL-STD-202, Method 213, Conditions C and I.	Standard: 30 g, 11 ms per MIL-STD-202 Method 213, Condition J. Optional: 100 g, 6 ms per MIL-STD-202, Method 213, Conditions C and I.
Humidity	100%, rh per MIL-STD-202, Method 103, Condition B.	Standard: 95 % rh, no condensation "C" option: 100% rh per MIL-STD-202, Method 103, Conditions B.
Seal	Hermetic per MIL-STD-883, Method 1014, Condition A2.	Standard: N/A "C" option: Available Per MIL-STD-202 Method 112, Condition D, when requested
OTHER OPTIONS	Other mechanical configurations and stability specifications tailored to customer's specific needs. Voltage frequency control (VCXO) in CO-231 and CO-400 Series; see page 72.	
HOW TO ORDER	see page 15	

Vectron is a QPL source for DIP TTL Clock Oscillators per M55310/16.

CO-400 SERIES

CO-40 □ □ – □ □ at □

- 4 pin DIP = 1, 14 pin DIP = 2, Surface mount = 6, Flatpack = 7, LCC = 8
- Initial Accuracy @ 25°C (A,B,C, D or E; leave blank with -9 stability option)
- Frequency
- Screen Class—see chart below (X for Standard, or option B, D, or S)
- Temperature Stability (0 for Standard, or option 1, 2, 5, 6, 7 or 9)

For Example

CO-401A-0X at 50 MHz is a 4 pin DIP with "A" initial accuracy of ±50 ppm, "Standard" stability of ±25 ppm over 0°C to +70°C, and is 100% screen tested to level "X"

CO-407E-2B at 100 kHz is a flatpack with "E" accuracy remotely settable to ±1 ppm, "-2" temperature stability of ±50 ppm over -55°C to +125°C, and is 100% screen tested to level "B"

SCREEN TESTING OF ABOVE MODELS

SCREEN TEST	MIL-STD-883 METHOD	Standard	Options		
		CLASS X	CLASS D	CLASS B	CLASS S
Stabilization Bake (150°C)	—	X	X	X	Class S screen test requirements include 24 hour additional bake-out, 80 hour additional burn-in, thermal shock, PIND test and radio-graphic inspection in addition to Class B Screening. Has major cost impact.
Seal Test (Gross and Fine)	1014, Cond A2	X	X	X	
Temperature Cycling (Thermal Shock)	1010, Cond B		X	X	
Burn-in, operating 160 hours @125°C	—		X	X	
Acceleration (5000g in Y_1 axis)	2001, Cond A			X	

CO-231, CO-238 SERIES

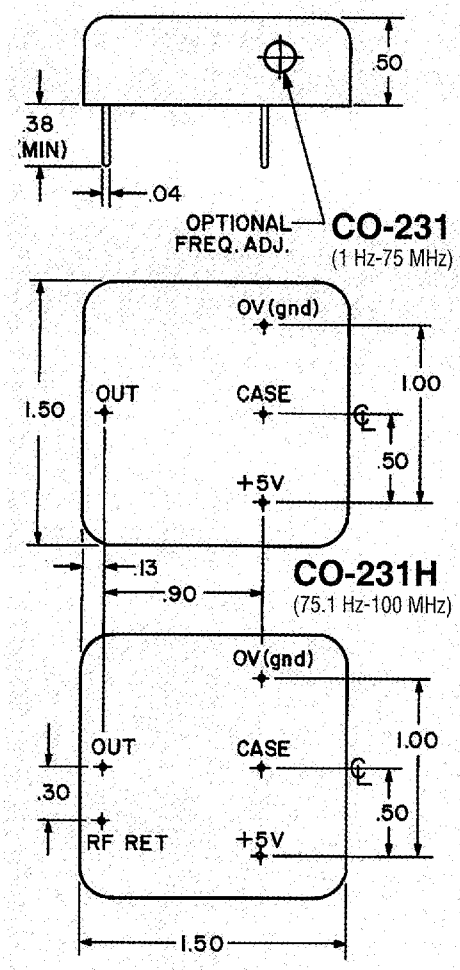
CO-23 □ □ – □ □ □ at □

- Basic Model
- Accuracy or tuning option (A, B, C, D or T)
- Frequency
- *"C" for sealed option
- *"Y" for improved aging option
- *Stability option

*Leave blank if -0 stability option or not applicable to your requirement.

For Example:
CO-238 at 6.144 MHz with ±.001% accuracy at 25°C and ±.005% over -55/+85°C = CO-238B-1 at 6.144 MHz
CO-231 at 60 Hz with ±.0001% accuracy (via tuning adjust) and ±.0025% over 0/70°C = CO-231T at 60 Hz

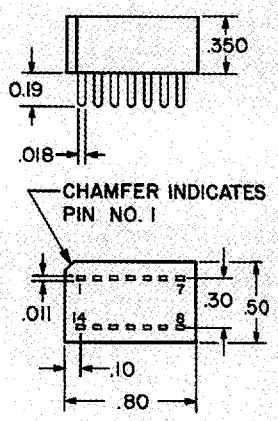
CO-231/CO-231H



CO-231C/CO-231HC

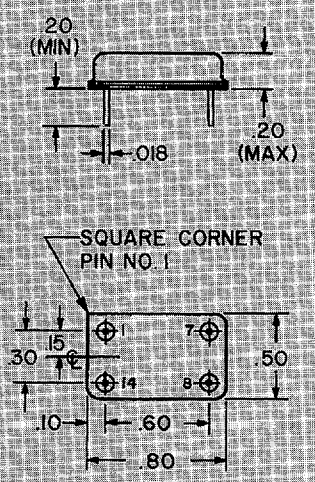
Same as above except height is 0.68" and pin diameter is 0.03".

CO-238



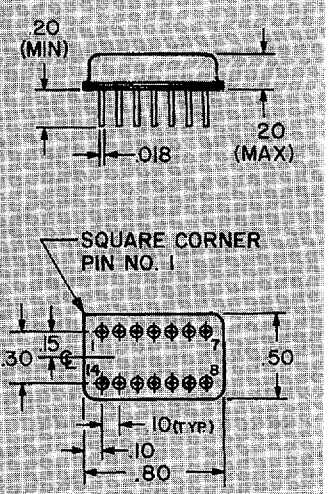
Function	Pin
+5V	14
OV, gnd	7
Output	4 (16 kHz-30 MHz) 8 (Above 30 MHz)
Other	N/C

CO-401

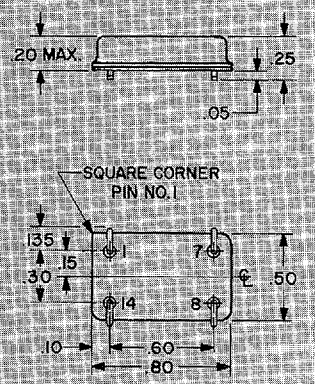


Available with insulated standoffs; increases height to 0.23" maximum

CO-402



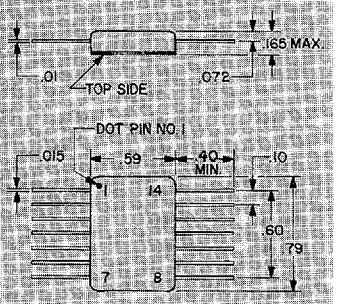
CO-406



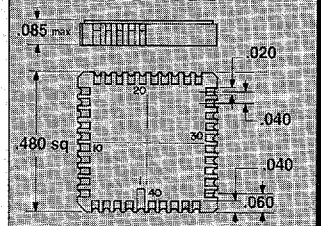
Function	Pin
*N/C	1
OV, case, gnd	7
Output	8
+5V	14
N/C	Other

*For external tuning. ±" accuracy connect variable capacitor with nominal range of 5 to 30 pf from pin 1 to pin 7.

CO-407



CO-408



Function	Pad
+5Vdc	4
+5Vdc	10
Ground	31
Ground	37
Output	39
N/C	Other

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

Immediate need? Please call. **(203) 853-4433**

We maintain a broad inventory of clock oscillators at numerous frequencies.