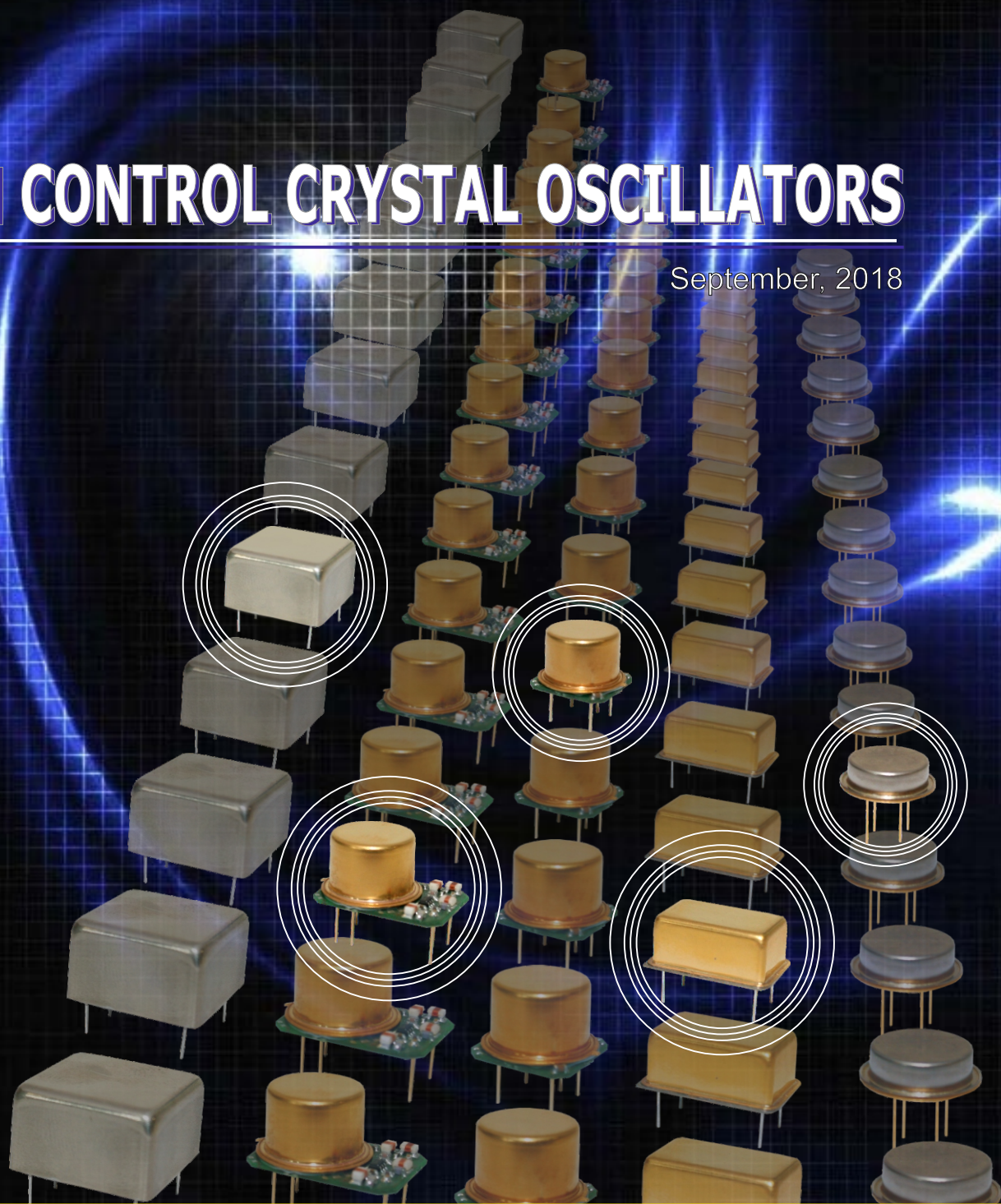




Magic Xtal Ltd.

OVEN CONTROL CRYSTAL OSCILLATORS

September, 2018





Utmost OCXOs Solutions!

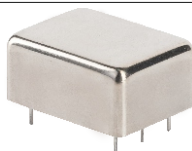
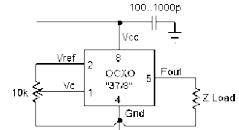
Being the world leader in the Internally Heated Resonator (IHR) technology Magic Xtal has created unique **MXO37** series providing in $(-40 + 85)^{\circ}\text{C}$ range up to 2 ppb temperature stability and -173 dBc/Hz noise floor at less than 180 mW power consumption and about 2 ccm volume. Utmost stability of the low power OCXOs is implemented in **MXO37/R** model packaged in 20x20x12.9 mm case and exhibiting 0.5 ppb temperature stability along with as low as 0.1 ppb/day aging.

In the field of ultra-high stability OCXOs Magic Xtal offers the double-oven **MXODE** model with 0.05 ppb frequency stability in $(-40 + 85)^{\circ}\text{C}$ range and the smallest in the class **MXODR** oscillator providing at 5 ccm packaging 0.1 ppb temperature stability and 0.1 ppb/day aging rate.

Moreover, portfolio of the company includes high stability low phase-noise OCXOs of **MXOC** and **MXOH** series in a variety of small packages, high durable low power oscillators withstanding up to 1000 g mechanical shocks and other OCXO solutions with customized combination of advanced performances.



High stability OCXOs of Magic Xtal production:

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Ultra low power high stability DIP8 compatible OCXOs

MXO37/8U and MXO37/8P models

The design of the **MXO37** family is built on a new generation of the Internally Heated Resonators (IHR) – the devices incorporating inside the TO-8 vacuum holder the crystal plate with integrated oven-control system. Application of the advanced IHR technology provides to the **MXO37** oscillators very small sizes, extremely low power consumption and short warm-up time combined with excellent frequency stability and low phase noise level.

Possessing unique combination of high frequency stability and low phase-noise with miniature sizes and extremely low power consumption the **MXO37/8P** oscillators are perfect frequency reference for various advanced electronic systems, especially portable and/or battery supplied, such as high-end mobile radio, underwater beacons, portable instrumentation, etc.

Specification

		MXO37/8U	MXO37/8P, MXO37/8PS-T
Operational frequency range		8 – 100 MHz	8 – 150 MHz
Output waveform		HCMOS	HCMOS, sine-wave
Phase noise level, floor		-165 dBc/Hz	-173 dBc/Hz
Frequency stability within (-40 +85)°C	for 10 MHz	10 ppb	5 ppb
	for 100 MHz	0.1 ppm	50 ppb
Allan deviation, 1s	for 10 MHz	5×10^{-12}	
Aging per day/year after 30 days operation	for 10 MHz	0.1 ppb / 15 ppb	
	for 100 MHz	2 ppb / 0.2 ppm	
Input voltage		3.3 V or 5 V	
Power consumption	warm up	0.8 W; 90 mW	0.8 W; <180 mW
	steady state		
Warm up time (to $\Delta f/f=1e-7$, at +25°C)		< 60 s	< 60 s to 15 s – special option
Mechanical durability		Vibration 0-2000 Hz, 10 G; shocks: 30 G, 11 ms	
G-sensitivity		1 ppb/G to 0.2 ppb/G – special option	

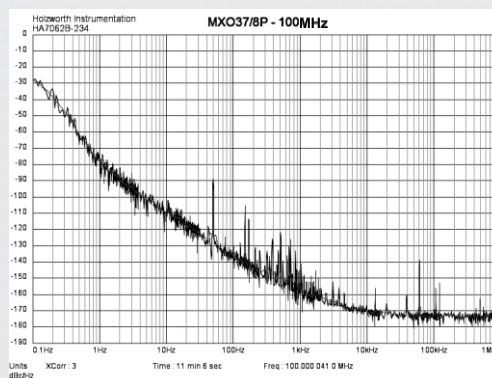
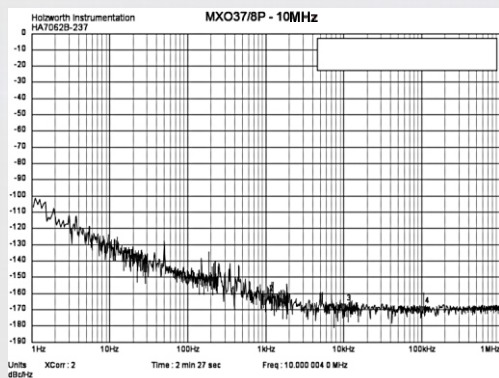
Packaging options:

MXO37/8U	MXO37/8US	MXO37/8P	MXO37/8PS	MXO37/8PS-T
				
16x15.3x10.7 mm	16x19x12.1 mm	16x15.3x10 mm	16x19x11.4 mm	16x15.3x9.5 mm

Ultra low power high stability DIP8 compatible OCXOs

MXO37/8U, MXO37/8P models

Phase-noise patterns



Part numbering:

MXO37/8U(S) MXO37/8P(S) MXO37/8PS-T	A,B,C,D,E,F, G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table. 2	Supply voltage: 3.3V or 5V	Output signal HCMOS, sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

MXO37/8U / MXO37/8P - 10 MHz								
XY		17	58	38	28	18	59	39
		1×10^{-7}	5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}	3×10^{-9}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/+	-/+
B	-10 +60°C	+/+	+/+	+/+	+/+	+/+	+/+	-/+
C	0 +70°C	+/+	+/+	+/+	+/+	+/+	-/+	-/-
D	-20 +70°C	+/+	+/+	+/+	+/+	+/+	-/+	-/-
E		+/+	+/+	+/+	+/+	+/+	-/+	-/-
F	-40 +85°C	+/+	+/+	+/+	+/+	+/+	-/+	-/-
G	-55 +85°C	+/+	+/+	+/+	+/+	+/+	-/-	-/-
Q	-60 +85°C	+/+	+/+	+/+	+/+	-/-	-/-	-/-

«+»— available option; «-»— unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	≤10 MHz
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	≤20 MHz
D	1 / 0.1	≤40 MHz
E	1.5 / 0.15	≤50 MHz
F	2 / 0.2	≤120 MHz
G	3 / 0.3	
H	5 / 0.5	≤150 MHz

Ultra low power high stability DIP14 compatible OCXOs

MXO37/14P and MXO37/14U models

The **MXO37/14** model as well as the **MXO37/8** oscillators is based on the Internally Heated Resonators (IHR) but has DIP14 compatible sizes and pins-out. At the same extremely low power consumption and fast warming up these devices provide better temperature stability, lower phase-noise level, extended operational frequency range.

The OCXOs operate at up to 150 MHz fundamental frequency at very low spurious level in the output spectra resulting in very low phase jitter.

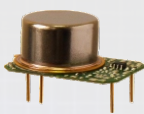
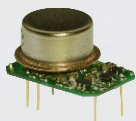
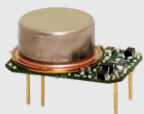
Being DIP14 compatible in size and pins-out the oscillators are produced in several type packagings including the SMD (**MXO37/14PST**) and low-profile (**MXO37/14L**) 7 mm height version.

Owing to the unique performances the **MXO37/14P, MXO37/14U** models are perfect solutions for different portable and/or battery supply devices and other applications where high frequency stability of the OCXO should be combined with its smallest sizes and lowest power consumption.

Specification

		MXO37/14P, MXO37/14PST	MXO37/14L	MXO37/14U
Operational frequency range		8 – 150 MHz		
Output waveform		HCMOS, sine-wave	HCMOS	HCMOS, sine-wave
Frequency stability within (-40 +85)°C	for 10 MHz	2 ppb	10 ppb	10 ppb
	for 100 MHz	30 ppb	50 ppb	50 ppb
Aging per day/year after 30 days operation	for 10 MHz	0.1 ppb / 15 ppb		
	for 100 MHz	2 ppb / 0.2 ppm		
Allan deviation, 1s	for 10 MHz	5×10^{-12}	10×10^{-12}	5×10^{-12}
	for 100 MHz	3×10^{-11}	5×10^{-11}	3×10^{-11}
Input voltage		3.3 V or 5 V		
Power consumption	warm up	0.8 W; to 180 mW		0.8 W
	steady state			< 90 mW
Warm up time (to $\Delta f/f = 1e-7$, at +25°C)		60 s 15 s – optionally	60 s	< 60 s
Mechanical durability		Vibration 0-2000 Hz, 10 G; shock: 30 G, 11 ms		
G-sensitivity		1 ppb/G to 0.2 ppb/G – special option		

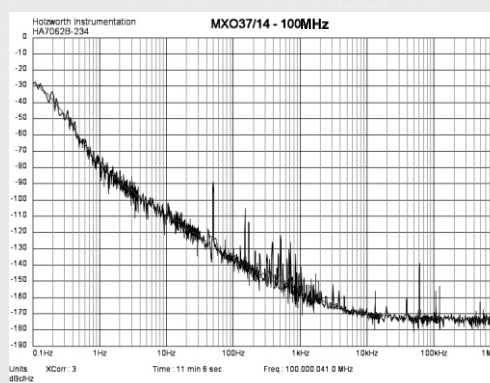
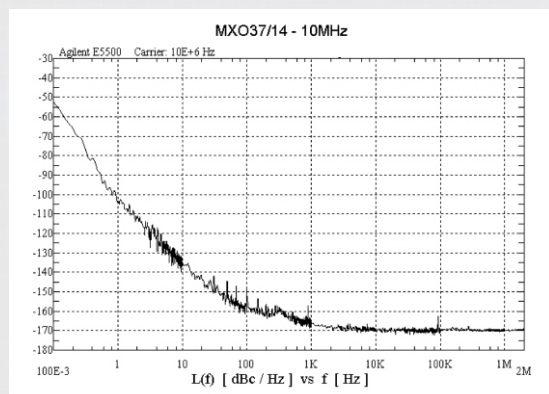
Packaging options:

MXO37/14U	MXO37/14US	MXO37/14P	MXO37/14PS	MXO37/14PS-T	MXO37/14L
					
21.6x15.3x10.7 mm	21.6x19x12.1 mm	21.6x15.3xH H=10 mm, 9 mm	21.6x19xH H=11.4 mm, 10.4 mm	20.9x15.3xH H=9.5 mm, 8.5 mm	21.6x15.3xH H=8 mm, 7mm

Ultra low power high stability DIP14 compatible OCXOs

MXO37/14U and MXO37/14P models

Phase-noise patterns



Part numbering:

MXO37/14U/S MXO37/14P(S,T) MXO37/14L	A,B,C,D,E,F, G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability – Table 1	Aging code: Tables 2	Supply voltage: 3.3 V or 5 V	Output signal HCMOS, sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

MXO37/14U / MXO37/14P - 10 MHz										
XY		17	58	38	28	18	59	39	29	19
		1×10^{-7}	5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}	3×10^{-9}	2×10^{-9}	1×10^{-9}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/+	-/+
B	-10 +60°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/+	-/+
C	0 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	-/+	-/+	-/+
D	-20 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	-/+	-/+	-/+
E	-30 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	-/+	-/+	-/+
F	-40 +85°C	+/+	+/+	+/+	+/+	+/+	-/+	-/+	-/+	-/-
G	-55 +85°C	+/+	+/+	+/+	+/+	+/+	-/+	-/-	-/-	-/-
Q	-60 +85°C	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-

«+» – available option; «-» – unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	≤10 MHz
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	≤20 MHz
D	1 / 0.1	≤40 MHz
E	1.5 / 0.15	≤50 MHz
F	2 / 0.2	≤120 MHz
G	3 / 0.3	
H	5 / 0.5	≤150 MHz

Ultra low power high frequency DIP14 compatible OCXOs

MXO37H/14, MXO37H/14U models

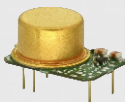
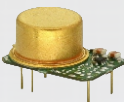
The **MXO37H** oscillators utilize the same internally heated resonator (IHR) designs providing very low power consumption, miniature sizes and fast warming up. In difference from the **MXO37** series it uses the internal frequency multiplication stage enabling extension of the operational frequencies up to 300 MHz and considerable improvement of the temperature stability and aging in 30-150 MHz range.

Owing to the unique performances the **MXO37H/14P** OCXO is perfect solution for high-end portable or/and battery supply devices as well as other modern applications where high frequency stability at high operational frequency of the reference oscillator should be combined with its smallest sizes and lowest power consumption.

Specification

		Utmost parameters for 100MHz with multiplication by 5	Utmost parameters for 300MHz with multiplication by 3
Operational frequency range		30 – 300 MHz	
Input voltage		3.3 V or 5 V	
Output waveform		HCMOS, sine-wave	
Power consumption	warm up	0.8 W;	
	steady state	< 180 mW for MXO37H/14, < 90mW for MXO37H/14U, MXO37H/14US	
Frequency stability within (-40 +85)°C		10 ppb	50 ppb
Aging per day/year after 30 days operation		0.5 ppb / 50 ppb	2 ppb / 0.2 ppm
Allan deviation, 1s		1×10^{-11}	5×10^{-11}
Sub-harmonics level		-40 dBc	
Warm up time (to $\Delta f/f = 1e-7$, at +25°C)		60 s 15 s – special option	
Mechanical durability		Vibration 0-2000 Hz, 10 G; shock: 30 G, 5 ms	
G-sensitivity		1 ppb/G to 0.2 ppb/G – special option	

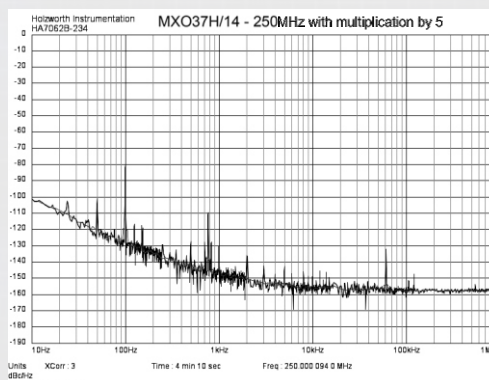
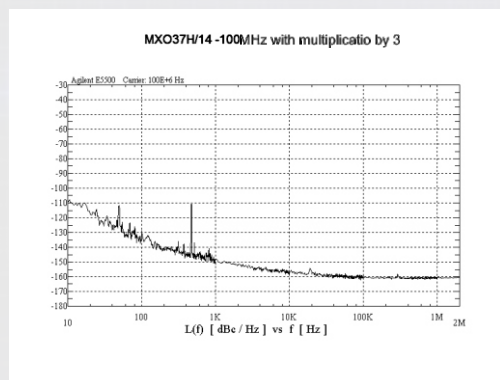
Packaging :

MXO37H/14	MXO37H/14S	MXO37H/14U	MXO37H/14US
			
21.6x15.3xH H=9.5, 10.7 mm	21.6x19xH H=10.9, 12.1 mm	21.6x15.3x10.7 mm	21.6x19x12.1 mm

Ultra low power high frequency DIP14 compatible OCXOs

MXO37H/14, MXO37H/14U models

Phase-noise patterns



Part numbering:

MXO37H/14(S) MXO37H/14U(S)	A,B,C,D,E,F,G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table 2	Supply voltage: 3.3 V or 5 V	Output signal HCMOS or sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

		100 MHz / 300 MHz					
XY		17	58	38	28	18	59
		1×10^{-7}	5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/-
B	-10 +60°C	+/+	+/+	+/+	+/+	+/-	-/-
C	0 +70°C	+/+	+/+	+/+	+/+	+/-	-/-
D	-20 +70°C	+/+	+/+	+/+	+/+	+/-	-/-
E	-30 +70°C	+/+	+/+	+/+	+/-	+/-	-/-
F	-40 +85°C	+/+	+/+	+/-	+/-	+/-	-/-
G	-55 +85°C	+/+	+/+	+/-	+/-	-/-	-/-
Q	-60 +85°C	+/+	+/+	+/-	+/-	-/-	-/-

«+»— available option; «-»— unavailable option

Table 2. Aging codes for ordering

		Aging per day/year after 30 days of operation, ppb/ppm
A	0.1 / 0.015	for 30-150 MHz range
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	
D	1 / 0.1	
E	1.5 / 0.15	for 150-300 MHz range
F	2 / 0.2	
G	3 / 0.3	
H	5 / 0.5	

Ultra low power shock resistant DIP8, DIP14 compatible OCXOs

MXO37/8D, MXO37/14D, MXO37H/14D models

The **MXO37D** is a kind of the low power oscillators of **MXO37** series with essentially strengthened mechanical construction enabling to them extra high resistance to the mechanical factors. Withstanding up to 500g shocks and 30 g wide band vibration the oscillators provide high frequency stability and low phase-noise level combined with very small sizes, low power consumption and short warm-up time.

The **MXO37/8D** and **MXO37/14D** models work in 8-100 MHz frequency range and are designed for different portable or/and battery supply devices and other equipment intended for operation in conditions of severe mechanical factors.

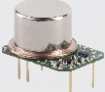
The **MXO37H/14D** version operates in 30-300 MHz range providing improved frequency stability owing to usage of the internal frequency multiplication circuitry.

Specification

	MXO37/8D, MXO37/14D		MXO37H/14D
Operational frequency range	8 – 100 MHz		30-300 MHz
Input voltage	3.3 V or 5 V		
Output waveform	HCMOS, sine-wave*		
Power consumption	1 W during warming up; 230 mW in steady state		
	Utmost OCXO parameters		
	10 MHz	100 MHz	100 MHz (multiplied by 5)
Frequency stability within (-40 +85)°C	10 ppb	50 ppb	20 ppb
Aging per day/year after 30 days operation	0.1 ppb / 15 ppb	2 ppb / 0.2 ppm	0.5 ppb / 50 ppb
Allan deviation, 1s	5×10^{-12}	5×10^{-11}	1×10^{-11}
Sub-harmonics level	-	-	- 40 dBc
Warm up time (to 100 ppb frequency set up +25°C)	60 s		
Vibration	Vibration 0-2000 Hz, 30 G		
Shock resistant	1000 g, 0.5 ms		
G-sensitivity	1 ppb/G 0.5 ppb/G – special option		

*sine-wave is not available for MXO37/8D

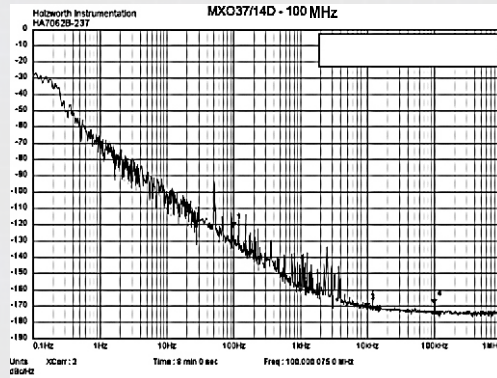
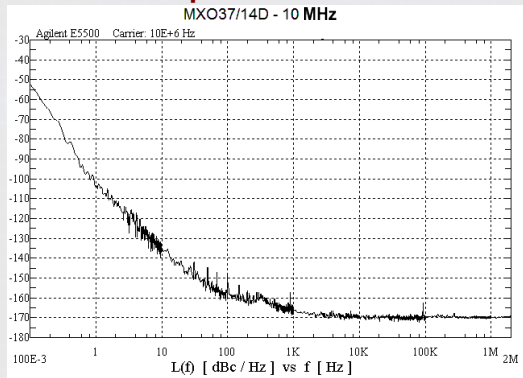
Packaging:

MXO37/8D	MXO37/14D, MXO37H/14D
	
15x15x10.5 mm	21x15x10.5 mm

Ultra low power shock resistant DIP8, DIP14 compatible OCXOs

MXO37/8D, MXO37/14D, MXO37H/14D models

Phase-noise patterns



Part numbering:

MXO37/8D MXO37(H)/14D	A,B,C,D,E,F,G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table 2	Supply voltage: 3.3 V or 5 V	Output signal HCMOS or sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering MXO37/14D

		10 MHz / 100 MHz					
XY		17	58	38	28	18	59
		1×10^{-7}	5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}
A	0 +50°C	+/+	+/+	+/+	+/+	+/-	+/-
B	-10 +60°C	+/+	+/+	+/+	+/+	+/-	+/-
C	0 +70°C	+/+	+/+	+/-	+/-	+/-	+/-
D	-20 +70°C	+/+	+/+	+/-	+/-	+/-	-/-
E	-30 +70°C	+/+	+/+	+/-	+/-	+/-	-/-
F	-40 +85°C	+/+	+/-	+/-	+/-	+/-	-/-
G	-55 +85°C	+/+	+/-	+/-	+/-	+/-	-/-
Q	-60 +85°C	+/+	+/-	+/-	+/-	+/-	-/-

«+»— available option; «-»— unavailable option

Table 2. Aging codes for MXO37/8D, MXO37/14D

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	≤10 Mhz
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	≤20 Mhz
D	1 / 0.1	≤40 Mhz
E	1.5 / 0.15	≤50 Mhz
F	2 / 0.2	≤100 Mhz
G	3 / 0.3	
H	5 / 0.5	≤100 Mhz

Aging codes for MXO37H/14D

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	for 30-150 MHz range
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	
D	1 / 0.1	for 150-300 MHz range
E	1.5 / 0.15	
F	2 / 0.2	
G	3 / 0.3	
H	5 / 0.5	

Ultra low power ultra-high stability hermetically sealed OCXOs

MXO37/R, MXO37H/R, MXO37/RU, MXO37H/RU models

The **MXO37/R** oscillators incorporates recent achievements in the IHR technology and the circuitry solutions that enables to them 0.5 ppb frequency stability in wide temperature range, very low aging and low phase-noise combining with less than 180 mW power consumption and 20x20x12 mm package sizes.

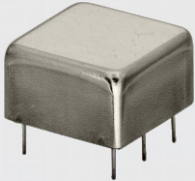
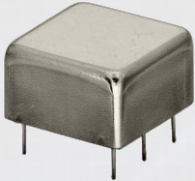
The **MXO37H/R, MXO37H/RU** model incorporates besides the internal frequency multiplication circuitry that enables extension of the operational frequencies up to 300 MHz and substantial improvement of the temperature stability and aging in 30-150 MHz range.

Being enveloped in hermetical steal case the oscillators can be employed in harsh environmental conditions (100% humidity, high or low pressure, etc.). The unique parameters of the oscillators make them very attractive for various applications with utmost requirement to the frequency stability associated with battery supply such as underwater equipment for geology or geophysics exploration, portable instrumentation and others.

Specification

	MXO37/R, MXO37/RU		MXO37H/R, MXO37H/RU
Operational frequency range	8 – 150 MHz		30 – 300 MHz
Input voltage	3.3 V or 5 V		
Output waveform	HCMOS, sine-wave		
Power consumption	1 W during warming up, 180 mW in steady state < 90mW - in steady state for MXO38/RU, MXO37H/RU		
	Utmost OCXO parameters		
	10 MHz	100 MHz	100 MHz
Frequency stability within (-40 +85)°C	0.5 ppb	5 ppb	1 ppb
Aging per day/year after 30 days operation	0.1 ppb / 15 ppb	2 ppb / 0.2 ppm	0.5 ppb / 50 ppb
Allan deviation, 1s	3×10^{-12}	5×10^{-11}	1×10^{-11}
Sub-harmonics level	-	-	- 40 dBc
Warm up time (to 100 ppb frequency set up +25°C)	<100 s		
Mechanical durability	Vibration 0-2000 Hz, 10 G; 30G, 11ms Vibration 0-1500 Hz, 10g for MXO37/RU, MXO37H/RU		
G-sensitivity	1 ppb/G to 0.2 ppb/g - special option		

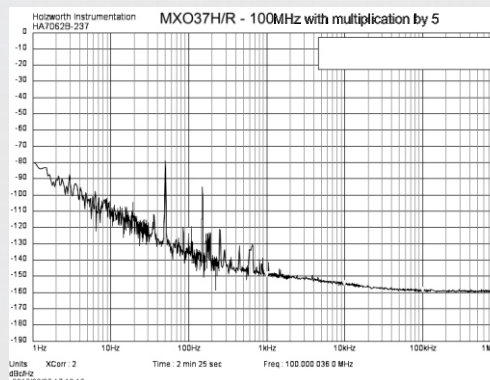
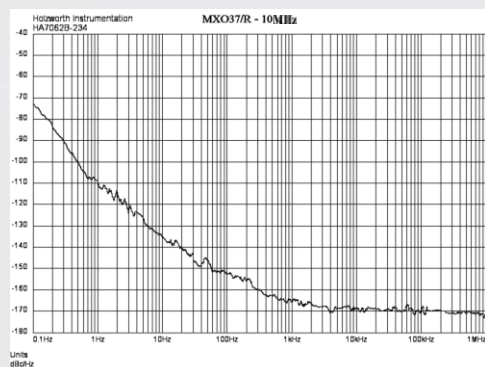
Packaging:

MXO37/R, MXO37H/R	MXO37/RU, MXO37H/RU
	
20.2x20.2xH H=12.5, 13.2, 14.6 mm	20.2x20.2x14.6 mm

Ultra low power ultra-high stability hermetically sealed OCXOs

MXO37/R, MXO37H/R, MXO37/RU, MXO37H/RU models

Phase-noise patterns



Part numbering:

MXO37/R(U) MXO37H/R(U)	A,B,C,D,E,J,F, G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table 2	Supply voltage: 3.3 V or 5 V	Output signal HCMOS or sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering MXO37/R, MXO37/RU

10 MHz / 100 MHz										
XY		58	38	28	18	59	39	19	50	30
		5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}	3×10^{-9}	1×10^{-9}	5×10^{-10}	3×10^{-10}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-
B	-10 +60°C	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-
C	0 +70°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-	-/-
D	-20 +70°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-	-/-
E	-30 +70°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-	-/-
J	-40 +80°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-	-/-
F	-40 +85°C	+/+	+/+	+/+	+/+	+/-	+/-	+/-	-/-	-/-
G	-55 +85°C	+/+	+/+	+/+	+/+	+/-	-/-	-/-	-/-	-/-
Q	-60 +85°C	+/+	+/+	+/-	+/-	-/-	-/-	-/-	-/-	-/-

«+» available option; «-» unavailable option

Table 2. Aging codes for MXO37/R

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.01	≤10 MHz
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	≤20 MHz
D	1 / 0.1	≤40 MHz
E	1.5 / 0.15	≤50 MHz
F	2 / 0.2	≤120 MHz
G	3 / 0.3	
H	5 / 0.5	≤150 MHz

Aging codes for MXO37H/R

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.01	for 30-150 MHz range
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	
D	1 / 0.1	for 150-300 MHz range
E	1.5 / 0.15	
F	2 / 0.2	
G	3 / 0.3	
H	5 / 0.5	

Ultra-high stability double-oven OCXOs

MXODE model

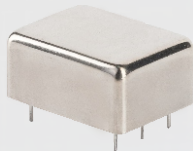
The oscillators of the **MXODE** use the double-oven structure for perfect temperature stabilization of the high precision crystal resonator and the oscillator circuitry. Packaged in standard 36x27x16 mm “europack” and consuming about 1.5 W power the OCXOs provide 5×10^{-11} stability in (-30 +70)°C range, to 5×10^{-13} /1s Allan deviation and 1×10^{-10} /day aging rate.

The **MXODE** can be used as Rb-standard replacement, in Stratum II clocks, instrumentations and in other high-end applications with utmost requirements to frequency stability of the reference oscillator.

Specification

Operational frequency range	5 – 100 MHz (above 20 MHz – using internal frequency multiplication)	
Input voltage	3,3 V, 5 V or 12V	
Output waveform	HCMOS, sine-wave	
Power consumption	6 W during warming up 1.5 W in steady state	
	Utmost parameters for 10MHz	Utmost parameters for 100MHz
Frequency stability within (-40 +85)°C	0.05 ppb	0.5 ppb
Aging per day/year after 30 days operation	0.1 ppb / 15 ppb	0.5 ppb / 50 ppb
Allan deviation, 1s	to 5×10^{-13}	5×10^{-12}
Sub-harmonics	-	-40 dBc
Warm up time (to $\Delta f/f = 1e-8$, at +25°C)	5 min	
Mechanical durability	Vibration 0-500 Hz, 5 G; shock 30 G, 11 ms Vibration 0-2000 Hz, 10 G; shock: 100 G, 11 ms - special option	
G-sensitivity	1 ppb/G 0.3 ppb/G - special option	

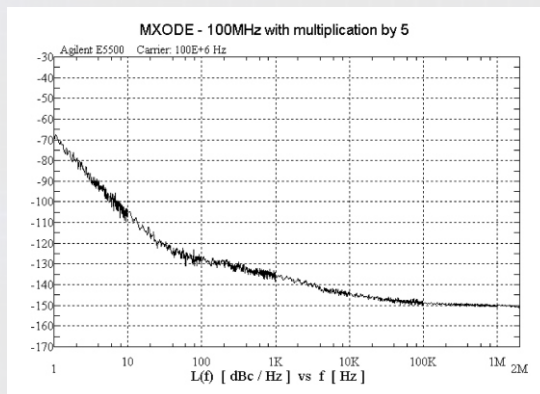
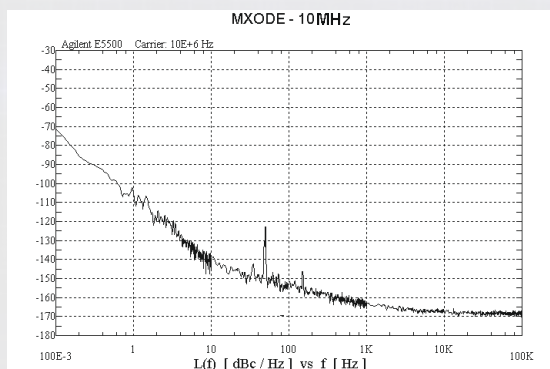
Packaging:

MXODE

36x27x16 mm

Ultra-high stability double-oven OCXOs

MXODE model

Phase-noise patterns



Part numbering:

MXODE	A,B,C,D,E,F,G,Q	XY	A,B,Z,C,D,E	3, 5, 2	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table 2	Supply voltage 3,3V, 5V, 12V	Output signal HCMOS or sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

		10 MHz					
XY		19	50	30	20	10	51
		1×10^{-9}	5×10^{-10}	3×10^{-10}	2×10^{-10}	1×10^{-10}	5×10^{-11}
A	0 +50°C	+	+	+	+	+	+
B	-10 +60°C	+	+	+	+	+	+
C	0 +70°C	+	+	+	+	+	+
D	-20 +70°C	+	+	+	+	+	+
E	-30 +70°C	+	+	+	+	+	+
F	-40 +85°C	+	+	+	+	+	+
G	-55 +85°C	+	+	+	+	+	+
Q	-60 +85°C	+	+	+	-	-	-

«+»— available option; «-»— unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm
A	0.1 / 0.015
B	0.2 / 0.02
Z	0.3 / 0.03
C	0.5 / 0.05
D	1 / 0.1
E	1.5 / 0.15
F	2 / 0.2
G	3 / 0.3

Ultra-high stability miniature double-oven OCXOs

MXODR model

The design of the **MXODR** utilizes the Internally Heated Resonator (IHR) additionally heated along with the oscillator circuitry inside the outer oven structure. The double temperature control of the crystal realized with the ordinary outer oven system enables to the oscillators up to 0.1 ppb frequency stability in $(-30 +70)^{\circ}\text{C}$ range at 5 ccm package volume and less than 1 W power consumption.

The **MXODR** oscillators operate in 5-100 MHz range, at above 20 MHz frequencies the internal frequency multiplication can be utilized to increase their temperature and long-term stability. The OCXO applications includes STRATUM II clocks, instrumentations, and other fields with utmost requirements to the frequency stability which before have been satisfied with conventional double-oven OCXOs having much bigger sizes and more power consumptions.

Specification

Operational frequency range	5 – 100 MHz (above 20 MHz – using internal frequency multiplication)	
Input voltage	3,3 V or 5 V	
Output waveform	HCMOS, sine-wave	
Power consumption	4 W during warming up 1 W in steady state	
	Utmost parameters for	
	10MHz	100 MHz (multiplied by 5)
Frequency stability within $(-40 +80)^{\circ}\text{C}$	0.1 ppb	0.2 ppb
Aging per day/year after 30 days operation	0.1 ppb / 15 ppb	0.5 ppb / 50 ppb
Allan deviation, 1s	2×10^{-12}	1×10^{-11}
Warm up time (to $\Delta f/f = 1 \times 10^{-7}$, at $+25^{\circ}\text{C}$)	90 s	
Mechanical durability	Vibration 0-2000 Hz, 10 G; shock 30G, 11 ms	
G-sensitivity	1 ppb/G 0.2 ppb/G - special option	

Packaging:

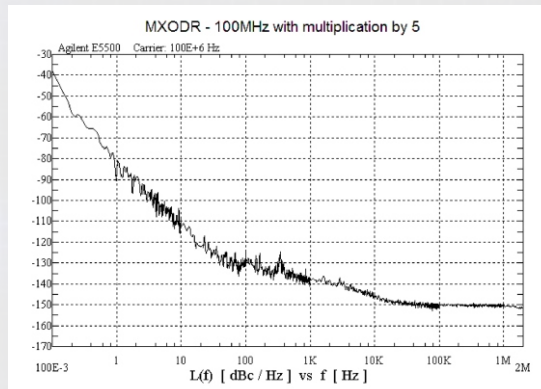
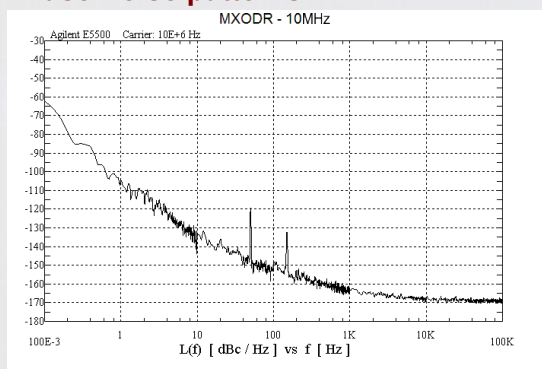
MXODR

20x20xH H=13, 14 mm

Ultra-high stability miniature double-oven OCXOs

MXODR models

Phase-noise patterns



Part numbering:

MXODR	A,B,C,D,E,J,F, G,Q	XY	A,B,Z,C,D,E, F,G	3, 5	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability - Table 1	Aging code - Table 2	Supply voltage: 3.3 V or 5 V	Output signal HCMOS or sine-wave	Operational frequency, MHz

Table 1. Temperature stability options

10 MHz							
XY		29	19	50	30	20	10
		2×10^{-9}	1×10^{-9}	5×10^{-10}	3×10^{-10}	2×10^{-10}	1×10^{-10}
A	0 +50°C	+	+	+	+	+	+
B	-10 +60°C	+	+	+	+	+	+
C	0 +70°C	+	+	+	+	+	+
D	-20 +70°C	+	+	+	+	+	+
E	-30 +70°C	+	+	+	+	+	+
J	-40 +80°C	+	+	+	+	+	+
F	-40 +85°C	+	+	+	+	+	-
G	-55 +85°C	+	+	+	+	-	-
Q	-60 +85°C	+	+	+	+	-	-

«+» – available option; «-» – unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm
A	0.1 / 0.01
B	0.2 / 0.02
Z	0.3 / 0.03
C	0.5 / 0.05
D	1 / 0.1
E	1.5 / 0.15
F	2 / 0.2
G	3 / 0.3

High stability low phase noise OCXOs

MXOCE, MXOCI, MXOCR, MXOCS models

The oscillators of the **MXOC** series are intended for a variety of modern applications with high demands to the frequency stability and phase-noise of the reference. The OCXOs utilize the module concept with the same internal structure being disposed in different standard packages on a customer requirement.

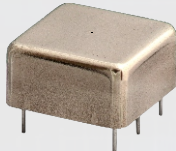
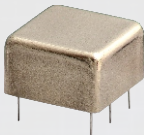
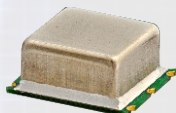
The OCXOs operate in 5-150 MHz range without frequency multiplication ensuring in $(-40 + 85)^{\circ}\text{C}$ range up to 1 ppb temperature stability and to 0.1 ppb/day aging along as well as very low phase-noise level reaching -115 dBc/Hz at 1 Hz offset and -176 dBc/Hz on the floor.

As a new development of MXOC series become high-temperature oscillators operating at up to $+125^{\circ}\text{C}$ temperature range and providing 10 ppb temperature stability along with 0.3 ppb aging per day

Specification

Operational frequency range	5 – 150 MHz	
Input voltage	3,3 V, 5 V or 12V	
Output waveform	HCMOS, sine-wave	
Power consumption	3.5 W during warming up 1 W in steady state	
	Utmost parameters for	
	10MHz	100 MHz
Frequency stability within $(-40 + 85)^{\circ}\text{C}$	0.5 ppb	3 ppb
Aging per day/year after 30 days operation	0.1 ppb / 15 ppb	2 ppb / 0.2 ppm
Allan deviation, 1s	5×10^{-13}	2×10^{-11}
Warm up time (to $\Delta f/f = 1 \times 10^{-7}$, at $+25^{\circ}\text{C}$)	3 min	
Mechanical durability	Vibration 0-2000 Hz, 10g for E, I, R packages, pins $\varnothing$ 0.8 mm Vibration 0-500 Hz, 10g for S and R packages, pins $\varnothing$ 0.5 mm Shock 30G, 11 ms; 500G, 1 ms - optionally	
G-sensitivity	1 ppb/G 0.3 ppb/G – special option	

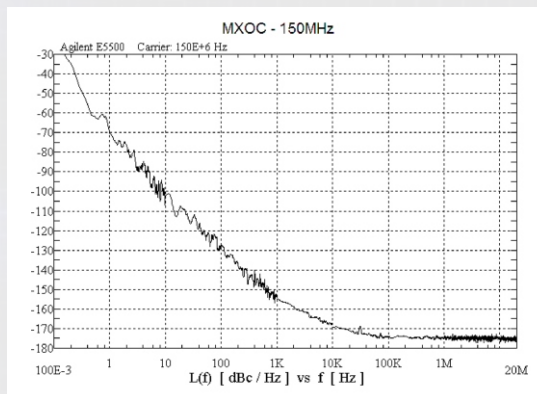
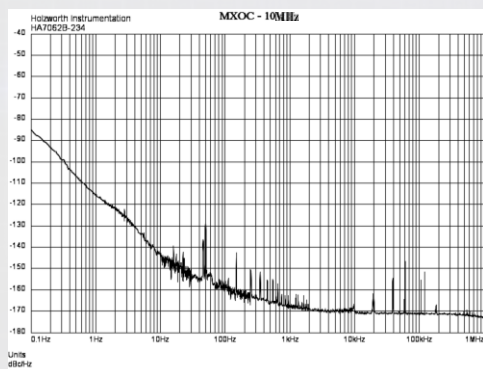
Packaging:

MXOCE	MXOCI	MXOCR	MXOCS
			
35.4x26.7xH H=11.0, 13.0, 13.6 mm	25.8x25.8xH H=10.8, 12.5, 13.5 mm	20.2x20.2xH H=10.6 12.5, 13.2 mm	25.4x22.0xH H=11.2, 12.9 mm

High stability low phase noise OCXOs

MXOCE, MXOCI, MXOCR, MXOCS models

Phase-noise patterns



Part numbering:

MXOC(E,I,R,S)	A,B,C,D,E,F, G,Q,H	XY	A,B,Z,C,D,E,F, G,H	3, 5, 2	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability – Table 1	Aging code: Tables 2	Supply voltage 3,3V, 5V or 12V	Output signal HCMOS, sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

10 MHz / 100 MHz										
XY		58	38	28	18	59	39	29	19	50
		5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}	3×10^{-9}	2×10^{-9}	1×10^{-9}	5×10^{-10}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-
B	-10 +60°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-
C	0 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-
D	-20 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-
E	-30 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-	+/-
F	-40 +85°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	+/-	+/-
G	-55 +85°C	+/+	+/+	+/+	+/+	+/-	+/-	+/-	+/-	-/-
Q	-60 +85°C	+/+	+/+	+/+	+/-	+/-	+/-	+/-	-/-	-/-
H	-40 +125°C	+/-	+/-	+/-	+/-	+/-	-/-	-/-	-/-	-/-

«+»— available option; «-»— unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	≤10 MHz
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	≤20 MHz
D	1 / 0.1	≤40 MHz
E	1.5 / 0.15	≤50 MHz
F	2 / 0.2	≤120 MHz
G	3 / 0.3	
H	5 / 0.5	≤150 MHz

High stability high frequency OCXOs

MXOHE, MXOHI, MXOHR, MXOHS series

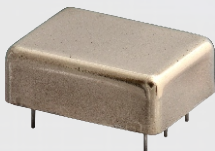
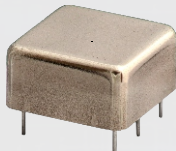
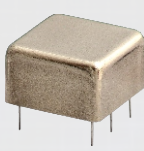
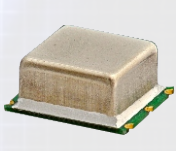
The **MXOH** series is designed to operate in 30-300 MHz range by using internal frequency multiplication circuitry. Owing to vibration on the low frequency crystal mode the OCXOs ensure at upper operational frequencies as high as 3 ppb temperature stability, 0.5 ppb/day aging and to 5E-12/1s Allan deviation.

Like the **MXOC** oscillators the **MXOH** series utilizes the module concept where the same internal structure is disposed in different small size standard packages in accordance with customers' demands.

Specification

Operational frequency range	30 – 300 MHz	
Input voltage	3,3 V, 5 V or 12V	
Output waveform	HCMOS, sine-wave	
Power consumption	3.5 W during warming up 1 W in steady state	
	Utmost parameters for 100MHz with multiplication by 5	Utmost parameters for 300MHz with multiplication by 3
Frequency stability within (-40 +85)°C	3 ppb	5 ppb
Aging per day/year after 30 days operation	0.5 ppb / 50 ppb	2 ppb / 0.2 ppm
Allan deviation, 1s	5×10^{-12}	2×10^{-11}
Sub-harmonics level	-40 dBc	
Warm up time (to $\Delta f/f=1e-7$, at +25°C)	3 min	
Mechanical durability	Vibration 0-2000 Hz, 10g for E, I, R packages, pins $\varnothing$ 0.8 mm Vibration 0-500 Hz, 10g for S and R packages, pins $\varnothing$ 0.5 mm Shock 30G, 11 ms Shock 500g, 1ms for E, I packages	
G-sensitivity	1 ppb/G 0.3 ppb/g - special option	

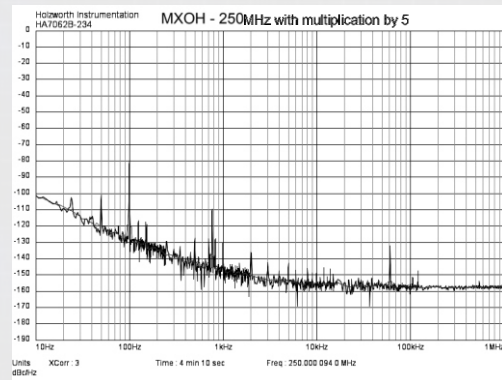
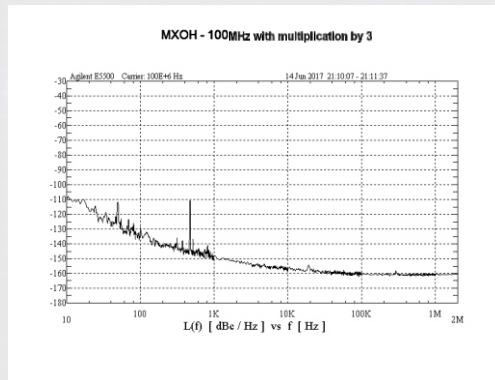
Packaging:

MXOHE	MXOHI	MXOHR	MXOHS
			
35.4x26.7xH H=11.0, 13.0, 13.6 mm	25.8x25.8xH H=10.8, 12.5, 13.5 mm	20.2x20.2xH H=10.6, 12.5, 13.2 mm	25.4x22.0xH H=11.2, 12.9 mm

High stability high frequency OCXOs

MXOHE, MXOHI, MXOHR, MXOHS series

Phase-noise patterns



Part numbering:

MXOH(E,I,R,S)	A,B,C,D,E,F, G,Q	XY	A,B,Z,C,D,E,F, G,H	3, 5, 2	S, T	-XXX.XXX
Series code	Temperature range - Table 1	Frequency vs. temperature stability – Table 1	Aging code: Tables 2	Supply voltage 3,3V, 5V or 12V	Output signal HCMOS, sine-wave	Operational frequency, MHz

Table 1. Temperature stability options for ordering

100 MHz / 300 MHz									
XY		58	38	28	18	59	39	29	19
		5×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-8}	5×10^{-9}	3×10^{-9}	2×10^{-9}	1×10^{-9}
A	0 +50°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-
B	-10 +60°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-
C	0 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-
D	-20 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-
E	-30 +70°C	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/-
F	-40 +85°C	+/+	+/+	+/+	+/+	+/+	+/+	+/-	-/-
G	-55 +85°C	+/+	+/+	+/+	+/+	+/+	+/-	+/-	-/-
Q	-60 +85°C	+/+	+/+	+/+	+/+	+/-	+/-	-/-	-/-

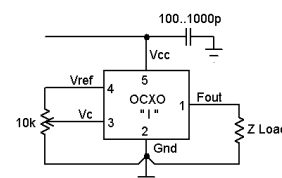
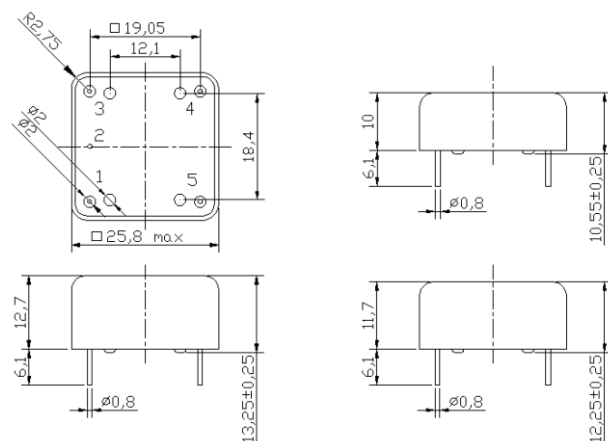
«+» – available option; «-» – unavailable option

Table 2. Aging codes for ordering

	Aging per day/year, ppb/ppm	Operational output frequency
A	0.1 / 0.015	for 30-150 MHz range
B	0.2 / 0.02	
Z	0.3 / 0.03	
C	0.5 / 0.05	
D	1 / 0.1	
E	1.5 / 0.15	for 150-300 MHz range
F	2 / 0.2	
G	3 / 0.3	
H	5 / 0.5	

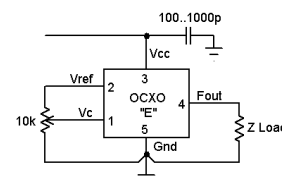
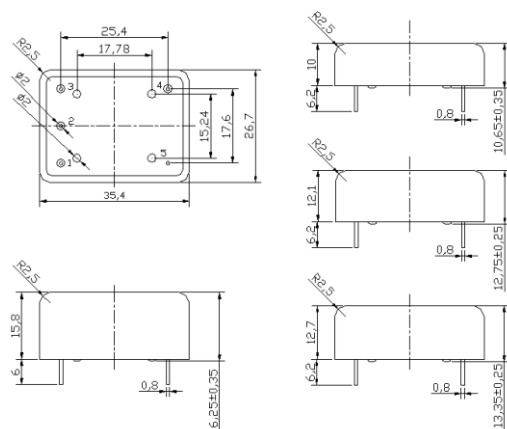
Packaging, drawings and electrical connections

Packaging MXOCI, MXOHI



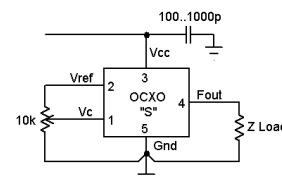
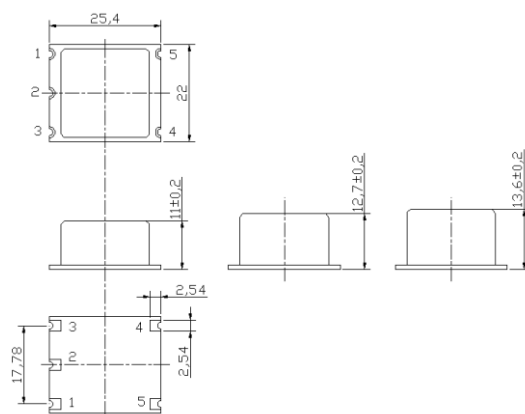
Pin	Signal
3	Electrical tuning
4	Reference voltage
5	+V Supply
1	RF Output
2	GND

Packaging options MXODE, MXOCE, MXOHE



Pin	Signal
1	Electrical tuning
2	Reference voltage
3	+V Supply
4	RF Output
5	GND

Packaging options MXOCS, MXOHS

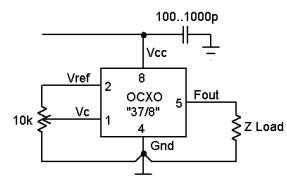
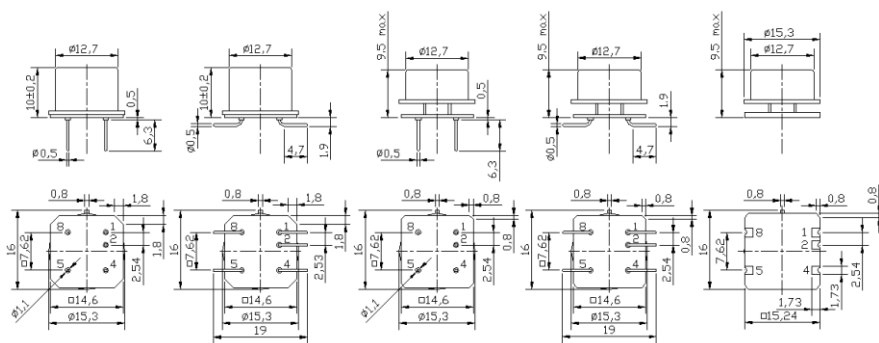


Pin	Signal
1	Electrical tuning
2	Reference voltage
3	+V Supply
4	RF Output
5	GND

Packaging, drawings and electrical connections

Packaging options

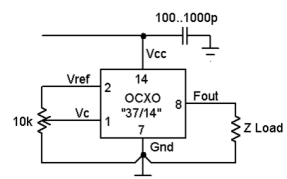
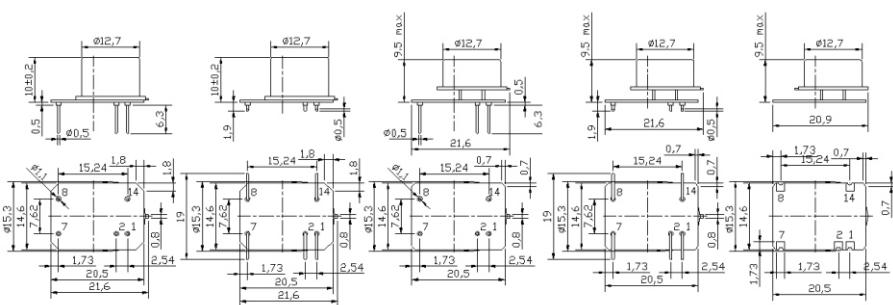
MXO37/8(U,D), MXO37/8(U,D)S, MXO37/8P, MXO37/8PS, MXO37/8PS-T



Pin	Signal
1	Electrical tuning
2	Reference voltage
8	+V Supply
5	RF Output
4	GND

Packaging options

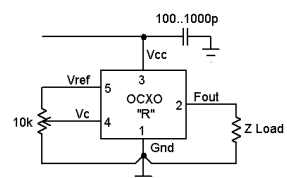
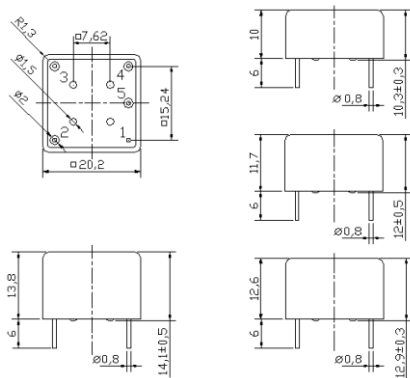
MXO37(H)/14(U,D), MXO37(H)/14(U,D)S, MXO37/14P, MXO37/14PS, MXO37/14PS-T



Pin	Signal
1	Electrical tuning
2	Reference voltage
14	+V Supply
8	RF Output
7	GND

Packaging options

MXO37/R, MXO37H/R, MXO37/RU, MXO37H/RU, MXODR, MXOCR, MXOHR



Pin	Signal
4	Electrical tuning
5	Reference voltage
3	+V Supply
2	RF Output
1	GND



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