



Revised in March 2015

Low power high-strength miniature OCXO

## Features MXO37/14D

Very small sizes  
 Ultra low power consumption: 0.23W at +25°C  
 Very high mechanical strength: to up 500G, 1 ms shocks,  
 Vibration 30G to 2000Hz sine  
 High frequency stability: to  $\pm 10$  ppb over -40°C to 85°C  
 Fast warming up: to 60s –typical, 30s – optionally  
 Operational frequency range: 8 – 100 MHz

## Typical Applications

Portable and battery fed wireless  
 Mobile test equipment  
 Beacons & Rescue systems  
 Equipment working at severe mechanical factors

14DIP compatible

## MXO37/14D

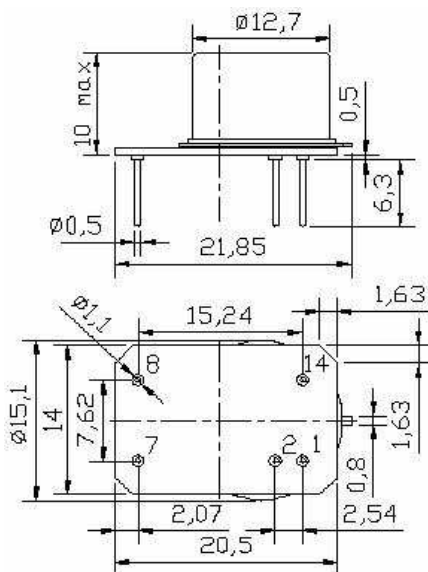


RoHS compliant

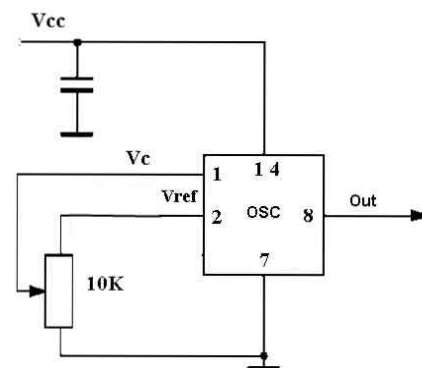
## Description

The MXO37 series uses the internal heating resonator (IHR) technology with arrangement of the whole oven system together with the crystal plate inside the TO-8 vacuum holder. Such approach results in radical reduction of the OCXO sizes, power consumption and its warm-up time providing at that excellent temperature stability, low phase-noise and aging. The MXO37/14D model utilizes essentially strengthened mechanical construction of the IHR enabling extraordinary mechanical durability.

## Physical Dimensions



## Pin Connections



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

**Specification**
**Ultra Low Power High Durable Miniature OCXO**

Parameter	Sym.	Conditions	Value			Unit	Note
			Min.	Typ.	Max.		
Frequency range	$f_0$		8		100	MHz	
<b>RF output</b>							
HCMOS	Load		10		15	kOhm pF	10 MHz op. freq.
	H-level voltage	$V_H$	$V_{cc}=5\text{ V}$ $V_{cc}=3.3\text{ V}$	3.8 2.4		V	
	L-level voltage	$V_L$			0.4	V	
	Duty cycle			45		55	%
	Rise/Fall time					10	ns
Sine-wave	Level	$L_S$			+8	dBm	
	Harmonics	$L_H$			-25	dBc	
	Load	$R_L$	45	50	55	Ohm	
	Sub-harmonics	$L_{SH}$			none	dBc	
<b>Power supply</b>							
Voltage	$V_{cc}$		4.75	5.0	5.25	V	3.3V available
Power consumption		Warm-up state Steady state, +25°C		1.0 0.23		W	
Warm-up time	$t_{up}$	to $\Delta f/f=1e-7$ , at +25°C, $V_{cc}=5\text{ V}$ to $\Delta f/f=1e-7$ , at +25°C, $V_{cc}=3.3\text{ V}$	30 40	60 70		s	ref. to frequency after 15 min for 10 MHz
<b>Frequency control</b>							
Control voltage range	$V_c$	$V_{cc}=5\text{ V}$ $V_{cc}=3.3\text{ V}$	0 0		4.2 2.8	V	Tuning slope - positive
Tuning range			$\pm 0.5$	$\pm 1$		ppm	
Reference voltage	$V_{ref}$	$V_{cc}=5\text{ V}$ $V_{cc}=3.3\text{ V}$	4.1 2.7	4.2 2.8	4.5 2.9	V	
<b>Frequency stability</b>							
vs. temperature		-30°C to +70°C, ref 25°C		$\pm 50$		ppb	See chart below
vs. supply voltage		ref $V_{cc}$ typ.		$\pm 2$		ppb	
vs. acceleration		Worst direction	0.5		$\pm 1$	ppb/G	
SSB Phase noise		1 Hz	-97/-	-95/-		dBc/Hz	For 10MHz/100 MHz operational frequency.
		10 Hz	-130/-95	-125/-90			
		100 Hz	-152/-125	-145/-120			
		1 kHz	-162/-155	-155/-150			
		10 kHz	-165/-165	-162/-162			
Aging	per day	after 30 days of operation		$\pm 0.5$		ppb	See chart below
	first year			$\pm 0.05$		ppm	
<b>Environmental, mechanical conditions.</b>							
Operating temperature range	See chart below.						
Storage temperature range	-60°C to +90°C						
Humidity	Non-condensing 95%						
Mechanical shock	Per MIL-STD-202, 500G half sine pulse, 1 ms						
Vibration	Per MIL-STD-202, 30G swept sine 10 to 2000 Hz						

**Ordering code**

MXO37	/14D-	C	58	C	5	S	-	10 MHz
1	2	3	4	5	6			

1 Temperature range	
Code	Specification
A	0°C..50°C
B	-10°C..60°C
C	0°C..70°C
D	-20°C..70°C
E	-30°C..70°C
F	-40°C..85°C
G	-55°C..85°C

2 Stability over temperature			
Code	Specification	Temperature range code available	
		10MHz	100MHz
XZ	$\pm Xe-Z$		
59	$\pm 5e-9$	A...B	-
18	$\pm 1e-8$	A...G	-
28	$\pm 2e-8$	A...G	A
38	$\pm 3e-8$	A...G	A...B
58	$\pm 5e-8$	A...G	A...G
17	$\pm 1e-7$	A...G	A...G

3 Aging: per day/per year, $10^{-9}/10^{-6}$		
Code		
Z	0.3/0.03	$\leq 10\text{ MHz}$
C	0.5/0.05	$\leq 20\text{ MHz}$
D	1/0.1	$\leq 40\text{ MHz}$
E	1.5/0.15	$\leq 50\text{ MHz}$
F	2/0.2	$\leq 100\text{ MHz}$
G	3/0.3	
H	5/0.5	

4 Supply voltage	
Code	Specification
3	3.3V $\pm 5\%$
5	5V $\pm 5\%$

5 Output	
Code	Specification
T	HCMOS/TTL
S	Sine-wave

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# Magic Xtal Ltd.

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Low power high-strength high frequency miniature OCXO

## Features MXO37H/14D

*Very small sizes*

*Ultra low power consumption: 0.23W at +25°C*

*Very high mechanical strength: to up 500G, 1 ms shocks,*

*Extended to 300 MHz frequency range (multiplication is used)*

*Vibration 30G to 2000Hz sine*

*Frequency stability to  $\pm 20$  ppb over -40°C to 85°C at 100 MHz*

*Fast warming up: to 60s to 0.1ppm accuracy*

*Operational frequency range: 30 – 300 MHz*

## Typical Applications

*Portable and battery fed wireless*

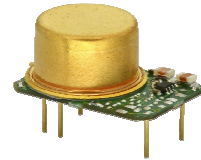
*Mobile test equipment*

*Beacons & Rescue systems*

*Equipment working at severe mechanical factors*

14DIP compatible

## MXO37H/14D

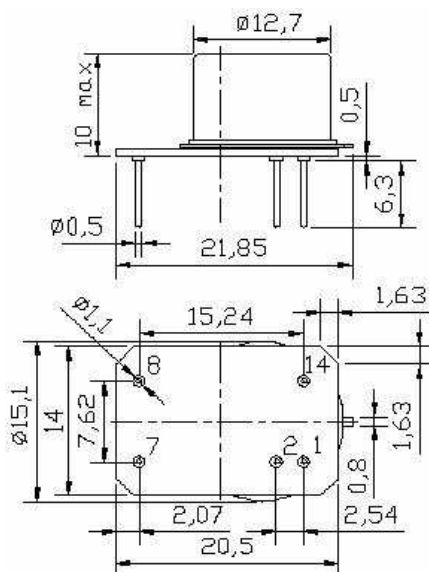


 RoHS compliant

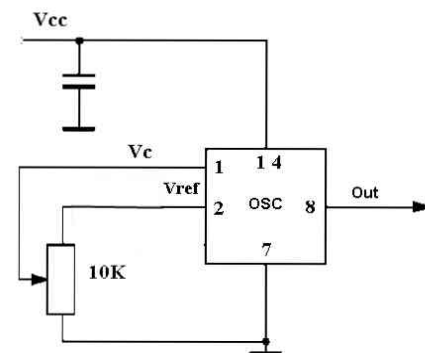
## Description

The MXO37 series uses the internal heating resonator (IHR) technology with arrangement of the whole oven system together with the crystal plate inside the TO-8 vacuum holder. Such approach results in radical reduction of the OCXO sizes, power consumption and its warm-up time providing at that excellent temperature stability, low phase-noise and aging. The MXO37H/14D model utilizes essentially strengthened mechanical construction of the IHR enabling extraordinary mechanical durability. Usage of the internal multiplication of frequency (by 3 or 5) enables extension of the operational frequencies up to 300 MHz and improvement as compared to the MXO37 series of the temperature stability and aging rate in 30-150 MHz range.

## Physical Dimensions



## Pin Connections



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



**Specification**

OCXO Specification	Sym.	Condition	Value			Unit	Note
			Min.	Typ.	Max.		
<b>Operational Frequency Range</b>	$f_0$		30		300	MHz	Frequency multiplication
<b>RF output</b>							
HCMOS/TTL compatible option	Load		10		5	kOhm pF	for 100MHz operational freq.
	H - level voltage	$V_H$	$V_{cc}=5V$ $V_{cc}=3.3V$	3.8 2.4		V	
	L - level voltage	$V_L$			0.4	V	
	Rise & Fall time				2.5	ns	for 100MHz operational freq.
	Duty cycle			45		55	%
Sine-wave option	Level	L	$V_{cc}=5V$		+8	dBm	
	Load	$R_L$			50	Ohm	
	Harmonics					-25	dBc
Subharmonics						-40	dBc
<b>Power supply</b>							
Voltage	$V_{cc}$		4.75	5.0	5.25	V	3.3V optional
Power consumption		Warm-up state Steady state, +25°C		1.0 0.230		W W	
Warm-up time	$t_{up}$	to $\Delta f/f=1e-7$ , at +25°C, $V_{cc}=5V$ to $\Delta f/f=1e-7$ , at +25°C, $V_{cc}=3.3V$		60 70		sec.	ref. to frequency after 10 min.
<b>Frequency control*</b>							
Control voltage range	$V_c$	$V_{cc}=5V$ $V_{cc}=3.3V$	0 0		4.2 2.8	V V	Positive tuning slope - standard option
Tuning range			$\pm 0.5$			ppm	for 100MHz operational freq.
Reference voltage	$V_{ref}$	$V_{cc}=5V$ $V_{cc}=3.3V$	4.10 2.70	4.20 2.80	4.30 2.90	V V	
<b>Frequency stability</b>							
vs. temperature		-40°C to +85°C, ref 25°C	$\pm 20$	$\pm 50$		ppb	For 100 MHz, see chart below
vs. supply voltage		ref $V_{cc}$ typ.		$\pm 5$		ppb	
vs. acceleration		Worst direction	$\pm 0.5$		$\pm 1$	ppb/G	
SSB Phase noise		10 Hz	-100			dBc/Hz	for 100MHz operational freq.
		100 Hz	-125				
		1 kHz	-145				
		10 kHz	-155				
		100 kHz	-160				
Allan variance		1 s		20		e-12	
Aging	per day	after 30 days of operation		$\pm 1$		ppb	See chart below
	first year			$\pm 0.1$		ppm	
<b>Environmental, mechanical conditions.</b>							
Operating temperature range	See chart below.						
Storage temperature range	-60°C to +90°C						
Humidity	Non-condensing 95%						
Mechanical shock	Per MIL-STD-202, 500G half sine pulse, 1 ms						
Vibration	Per MIL-STD-202, 30G swept sine 10 to 2000 Hz						
Washing conditions	Washing with water or alcohol based detergent allowed only with final enough drying stage						
Soldering conditions	Hand solder only – not reflow compatible. 260°C 10s (on pins)						

\* No frequency control option – on customer requirement

**Ordering code**

MXO37H /14D<sup>1</sup> E<sup>2</sup> 17<sup>3</sup> C<sup>4</sup> 5<sup>5</sup> S - 100 MHz

1	Temperature range
Code	Specification
A	0°C..50°C
B	-10°C..60°C
C	0°C..70°C
D	-20°C..70°C
E	-30°C..70°C
F	-40°C..85°C
G	-55°C..85°C

2		Stability over temperature	
Code	Specification	Temperature range code available for	
		100 MHz	300 MHz
XZ	$\pm X e-Z$		
59	$\pm 5 e-9$	A	-
18	$\pm 1 e-8$	A...F	A
28	$\pm 2 e-8$	A...G	A...E
58	$\pm 5 e-8$	A...G	A...G
17	$\pm 1 e-7$	A...G	A...G

3		Aging per day/year, ppb/ppm	
Code	Specification		
Z	0.3/0.03	For frequency range of 30-150 MHz	
C	0.5/0.05		
D	1/0.1		
E	1.5/0.15		
F	2/0.2	For frequency range of 150-300 MHz	
G	3/0.3		
H	5/0.5		

4		Supply voltage	
Code	Specification		
3	3.3V $\pm$ 5%		
5	5V $\pm$ 5%		

5		Output	
Code	Specification		
T	HCMOS/TTL		
S	Sine-wave		

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