

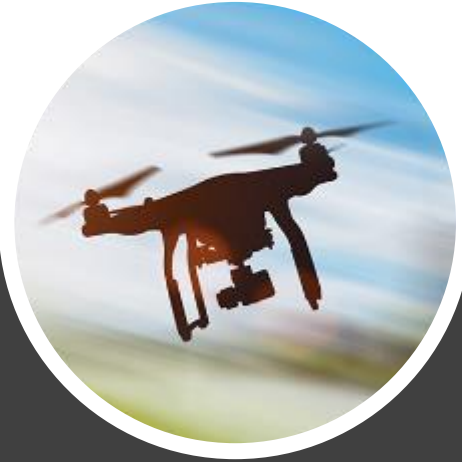
# Defense Product Solutions



# Rakon's Key Markets and Products



TELECOMMUNICATIONS



GLOBAL POSITIONING



SPACE & DEFENSE



EMERGING & OTHER

- SUB-SYSTEMS
- USO
- OCSO
- OCXO
- TCXO
- VCXO
- XO
- SAW FILTERS
- CRYSTAL RESONATORS



# Rakon Frequency Control Products



CRYSTALS	CRYSTAL FILTERS	XOs	VCXO & VCSOs	TCXOs	OCXOs	SAW AND RSS
<p>SMD</p>	<p>Hi-Rel Defense</p>	<p>Low Noise &amp; Jitter</p>	<p>Low Noise &amp; Jitter</p>	<p>High Stability</p>	<p>IC-OCXO</p>	<p>SAW Filters</p>
<p>T-sensing</p>	<p>Hi-Rel Space</p>	<p>Selectable</p>	<p>Selectable</p>	<p>Ultra Stable</p>	<p>Discrete OCXO</p>	<p>OCXO</p>
<p><i>g</i>-performance</p>	<p>Hi-Rel Defense</p>	<p>Hi-Rel Space</p>	<p>Hi-Rel Space</p>	<p><i>g</i>-Performance</p>	<p>Hi-Rel Defense</p>	<p>VCXO</p>
<p>Hi-Rel Space</p>		<p>Hi-Rel Space</p>	<p>New Space</p>	<p>Hi-Rel Space</p>	<p>Hi-Rel Space</p>	<p>Sub-Systems</p>
		<p>New Space</p>	<p>Defense &amp; Hi-Rel</p>		<p>New Space</p>	

# Key Markets vs Product Families



TELECOMMUNICATIONS	GLOBAL POSITIONING	HI-REL SPACE	NEW SPACE	DEFENSE & OTHER HI-REL APPS	INSTRUMENTATION
<p>Crystal resonators</p> 	<p>Crystal resonators</p> 	<p>Crystal resonators</p> 	<p>XO</p> 	<p>Crystal resonators</p> 	<p>High Stability OCXO</p> 
<p>XO</p> 	<p>XO</p> 	<p>Crystal filters</p> 	<p>VCXO</p> 	<p>Crystal &amp; SAW filters</p>  	<p>Low Noise OCXO</p> 
<p>VCXO</p> 	<p>VCXO</p> 	<p>XO</p> 	<p>OCXO</p> 	<p>XO</p>  	<p>Low Noise OCSO</p> 
<p>TCXO</p> 	<p>TCXO</p> 	<p>VCXO</p> 		<p>Low g-sensitivity TCXO</p> 	<p>Synthesizers</p> 
<p>OCXO</p> 		<p>TCXO</p> 		<p>Low Noise OCSO &amp; OCSO</p> 	
		<p>OCXO</p> 		<p>Sub-Systems &amp; Synthesizers</p>  	

# Defense Solutions – XO, TCXO and OCXO



XO, TCXO, OCXO

LOW NOISE OSCILLATORS

HIGH STABILITY OSCILLATORS

SUB-SYSTEMS



APPLICATIONS: JET FIGHTERS, MISSILES, LAND & SEA-BASED RADARS, ELECTRONIC WARFARE SYSTEMS, UAVS

# High Performance XO – RX05032AD

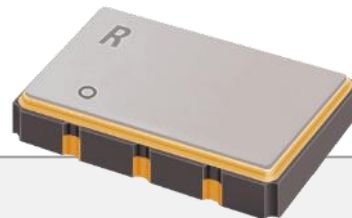


## RX05032AD XO Applications:

- ❑ Aeronautics
- ❑ Defense systems
- ❑ High Reliability applications

## Features:

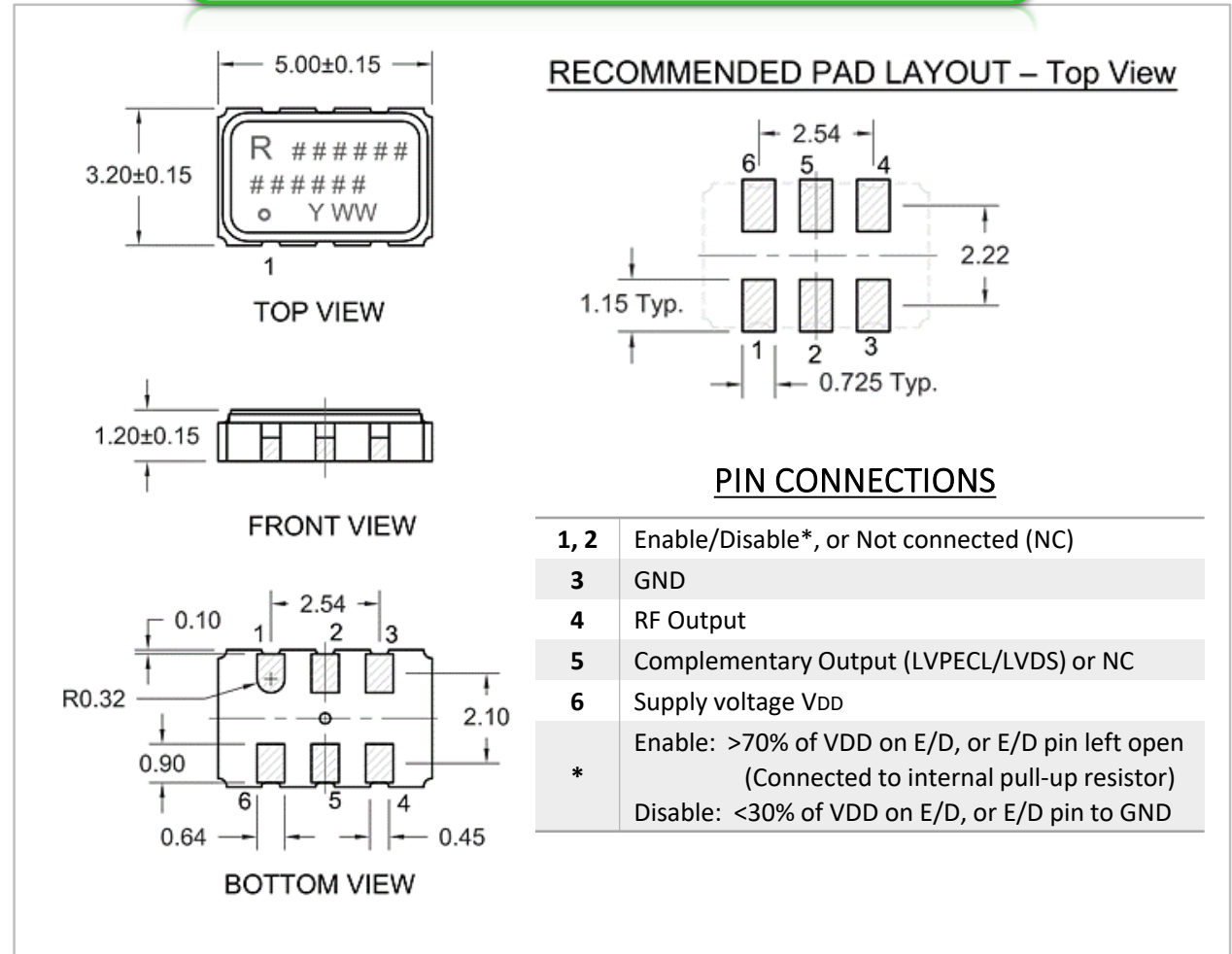
- ❑ Low phase noise and RMS phase jitter
- ❑ Short lead time



## Key Specifications:

<b>Frequency</b>	8 to 1500 MHz
<b>Output waveform</b>	CMOS, LVPECL, LVDS
<b>Absolute Frequency Drift (AFD)</b>	
Option I:	± 50 ppm max. (-40 to +85°C)
Option M:	± 75 ppm max. (-55 to +125°C)
<b>Supply voltage</b>	2.5 V or 3.3 V
<b>RMS Phase Jitter</b>	0.9 ps Typ. (Integrated 12 kHz – 20 MHz)

## RX05032AD Model Outline

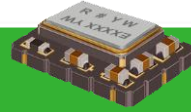


# Pluto+™ TCXO Solutions for Defense



## RPT7050A

7.0 x 5.0 x 2.0 mm, 10 to 60 MHz



## RPT7050D

7.0 x 5.0 x 1.8 mm, 16 to 60 MHz



SPECIAL SPECIFICATIONS		HIGH STABILITY	LOW AGEING	HIGH SHOCK RESISTANCE	LOW G-SENSITIVITY	HIGH SHOCK RESISTANCE
Stability f<40 MHz	-55 to 105°C	± 0.2 ppm	± 0.2 ppm	± 1.0 ppm	± 0.5 ppm	± 1.0 ppm
	-40 to 85°C	± 0.1 ppm	± 0.1 ppm	± 0.5 ppm	± 0.2 ppm	± 0.5 ppm
Ageing f=10 MHz	1 year	<1 ppm	<0.5 ppm	<1 ppm	<1 ppm	<1 ppm
	10 year	<2.5 ppm	<1.5 ppm	<2.5 ppm	<2.5 ppm	<2.5 ppm
g-Sensitivity		≤2 ppb/g	≤2 ppb/g	≤2 ppb/g	≤0.2 ppb/g	≤0.5 ppb/g
High shock resistance		<5000 g	<5000 g	<20,000 g	<10,000 g	<20,000 g
Slope		± 0.05 ppm/°C			± 0.05 ppm/°C	
Phase Noise f=10 MHz typ		-110 dBc/Hz @ 10 Hz -157 dBc/Hz ≥ 100 kHz			-110 dBc/Hz @ 10 Hz -157 dBc/Hz ≥ 100 kHz	
Supply Voltage		2.5 – 6 V			2.5 – 6 V	
Output Type		ACMOS, HCMOS, Sinewave, Clipped Sinewave			ACMOS, HCMOS, Sinewave, Clipped Sinewave	

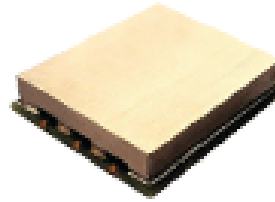
# Low Noise VCSO

**rakon**

Enabling the connected future

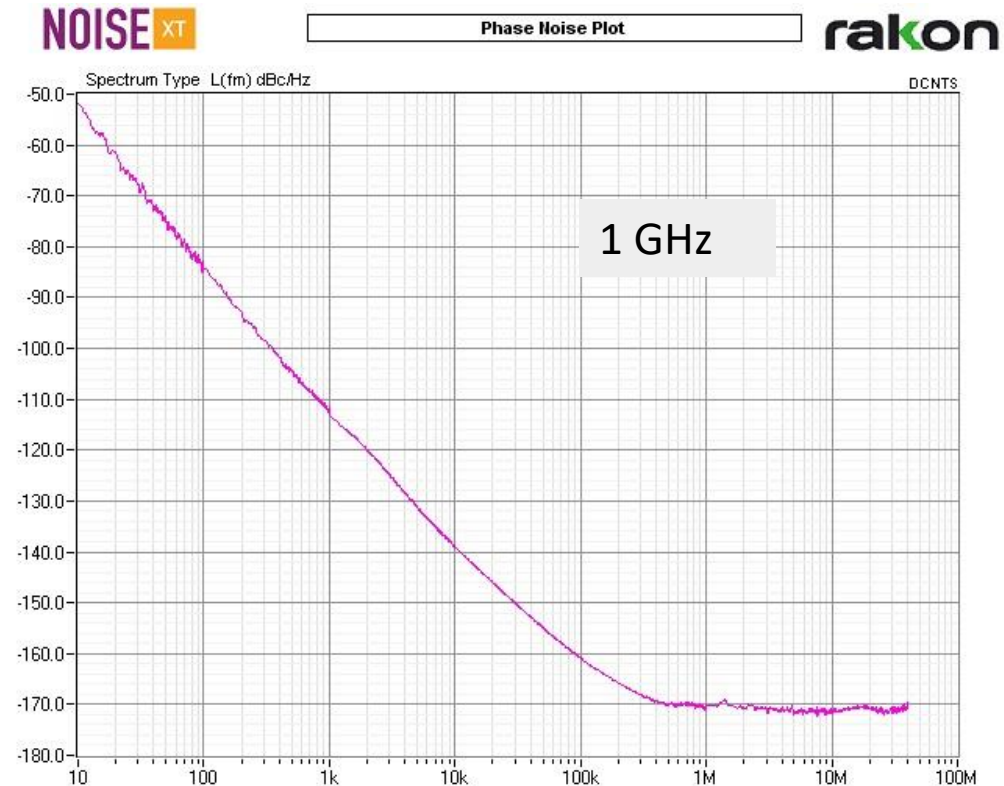
## ← Based on OCSO grade E format

- SMD
- 25 x 22 mm<sup>2</sup>
- Lower profile: 5 mm



## ← Features

- Fundamental frequency: from 500 MHz to 1 GHz
- With internal doubler: up to 2 GHz band
- +5V power supply (+12V on request)
- Consumption
  - < 50 mA for fundamental
  - < 100 mA with internal doubler activated
- Output power < +10 dBm
- Operating temperature: -40 to +85°C





# Rakon's OCXO and OCSO Snapshot




A RANGE OF OCXO AND OCSO SOLUTIONS FOR TELECOMMUNICATIONS, THROUGH TO DEFENSE, INSTRUMENTATION AND SPACE APPLICATIONS, AS WELL AS GROUND STATIONS

## Mercury™ IC OCXO (RFPO...)



### KEY FEATURES:

- Freq.: 5 to 100 MHz
- Low component count
- Frequency stability down to  $10^{-8}$

### MARKET:

- Telecommunications
- Defense

## Discrete OCXO (ROX...)



### KEY FEATURES:

- Freq.: 5 to 65 MHz
- Excellent holdover stability
- Frequency stability down to  $10^{-11}$

### MARKET:

- Telecommunications

## Ground USO (HSO1...)



### KEY FEATURES:

- Freq.: 5 to 10 MHz
- $8 \times 10^{-14}$  short-term stability (Allan Dev.)
- Frequency stability down to  $10^{-11}$

### MARKET:

- Ground Stations

## Space OCXO (RK4...)



### KEY FEATURES:

- Freq.: 5 to 130 MHz
- High reliability Space qualified
- Frequency stability down to  $10^{-11}$

### MARKET:

- Space

## Low Noise OCXO (LNO100)



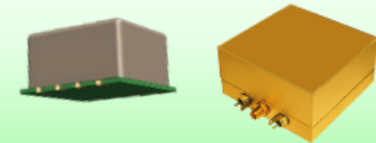
### KEY FEATURES:

- Freq.: 10 to 125 MHz
- Meeting the most demanding phase noise requirements
- Frequency stability down to  $10^{-6}$

### MARKET:

- Defense
- Instrumentation

## Ultra Low Noise OCSO (LNO320...5000)



### KEY FEATURES:

- Freq.: 320 MHz to 5 GHz
- Noise floor: -180 dBc/Hz for 320 – 500 MHz
- Frequency stability down to  $10^{-6}$

### MARKET:

- Defense
- Instrumentation

# ASIC OCXO for Defense (COTS\* products)



## Mercury™ ASIC OCXO – SMD



**Applications:** Time and frequency reference

<b>Model</b>	RFPO40, RFPO50
<b>Package</b>	9.7 x 7.5 x 4.3 mm 14.5 x 9.5 mm
<b>Frequency</b>	5 to 50 MHz
<b>FvsT</b>	±25 to ±100 ppb
<b>Temperature range</b>	-40 to +85°C
<b>Supply voltage</b>	2.7 – 5.5 V
<b>Key features</b>	<ul style="list-style-type: none"> <li>Small form factor and low power consumption</li> <li>FvsT as low as ±10 ppb / -20 to 70°C</li> </ul>

## Mercury™ ASIC OCXO – DIL



**Applications:** Time and frequency reference

<b>Model</b>	RFPO60
<b>Package</b>	22.7 x 13.08 x 8.65 mm
<b>Frequency</b>	5 to 50 MHz
<b>FvsT</b>	±25 to ±100 ppb
<b>Temperature range</b>	-40 to +85°C
<b>Supply voltage</b>	2.7 – 5.5 V
<b>Key features</b>	<ul style="list-style-type: none"> <li>Low power consumption and high reliability</li> <li>FvsT as low as ±10 ppb / -20 to 70°C</li> </ul>

**COTS\*:** Commercial Off-The-Shelf

# Defense Solutions – Low Noise Oscillators



XO, TCXO, OCXO

LOW NOISE OSCILLATORS

HIGH STABILITY OSCILLATORS

SUB-SYSTEMS



APPLICATIONS: JET FIGHTERS, MISSILES, LAND & SEA-BASED RADARS, ELECTRONIC WARFARE SYSTEMS, UAVS

# Ultra Low Noise Oscillators Overview

## ◀ Ultra low phase noise OCSO and OCXO versus applications

APPLICATIONS	INSTRUMENTATION GROUND	GROUND SHIPBOARD	AIRBORNE
<p><b>OCSO</b> 1 – 10 GHz</p>	<p><b>E:</b> 25x22x13 mm <b>Frequency:</b> 1.2 GHz</p> 	<p><b>B3:</b> 120x76x23 mm <b>Frequency:</b> 3.2, 4.8, 5 GHz</p>  <p><b>B1:</b> 95x76x23 mm <b>Frequency:</b> 1.28, 1.92, 2 GHz</p> 	<p><b>D1+SDB:</b> 70x70x55 mm <b>Frequency:</b> 3.2, 4.8, 5 GHz</p> 
<p><b>OCSO</b> 320 – 1000 MHz</p>	<p><b>E:</b> 25x22x13 mm <b>Frequency:</b> 400, 500, 600, 800, 1000 MHz</p> 	<p><b>B1/2:</b> as small as 48x48x13 mm <b>Frequency:</b> 320, 480, 500, 640, 960, 1000 MHz</p> 	<p><b>D1:</b> 70x70x35 mm <b>Frequency:</b> 320, 480, 500, 640, 960, 1000 MHz</p> 
<p><b>OCXO</b> 10 – 125 MHz</p>	<p><b>PTH1/2/3:</b> as small as 25x25x13 mm <b>Frequency:</b> 10, 80, 100, 120, 125 MHz</p>  <p><b>SMD1:</b> 25x22x13 mm <b>Frequency:</b> 80, 100, 120, 125 MHz</p> 	<p><b>PSS1:</b> 38x38x25 mm <b>Frequency:</b> 80, 100, 120, 125 MHz</p> 	<p><b>ULN D:</b> 60x60x40 mm <b>Frequency:</b> 80, 100, 120, 125 MHz</p>  <p><b>ULN C:</b> 65x50x27 mm <b>Frequency:</b> 80, 100, 120, 125 MHz</p> 

# 10 MHz Ultra Low Noise & ADEV OCXO



## Applications:

- SAT Communications, Test equipment, Simulator, Reference oscillator, RADAR

## Performances:

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal frequency	Initial tolerance $\pm 0.1$ ppm	-	10	-	MHz
Reference voltage	$V_{REF}$	9.5	10	10.5	V
Frequency adjustment	Positive slope 0 to $V_{REF}$	$\pm 0.3$	-	$\pm 0.7$	ppm
Frequency stability vs temperature	Referenced to 25°C	-	-	$\pm 1$	ppb
Frequency variation vs. supply voltage	Over operating temperature	-	-	$\pm 0.1$	ppb
Frequency variation vs. load	@ 25°C	-	-	$\pm 0.5$	ppb
Aging	Per year	-	-	$\pm 30$	ppb
	10 years	-	150	$\pm 300$	ppb
Allan variance	1s	-	1.5E-13	3E-13	-
Output waveform	-	Sine			
Output level	$V_{CC} = 12V$	5	-	10	dBm
Harmonics level	Over operating temperature 1MHz to 500MHz	-	-	-30	dBc
Non-harmonics level	1MHz to 5GHz	-	-	-100	dBc

## Phase Noise:

Parameters	1Hz	10Hz	100Hz	1kHz	10kHz	Unit
@ $V_{CC} = 12V$	-119	-140	-157	-163	-165	dBc/Hz



Dimensions: 2" x 2" x 0.63"  
50 x 50 x 16 mm

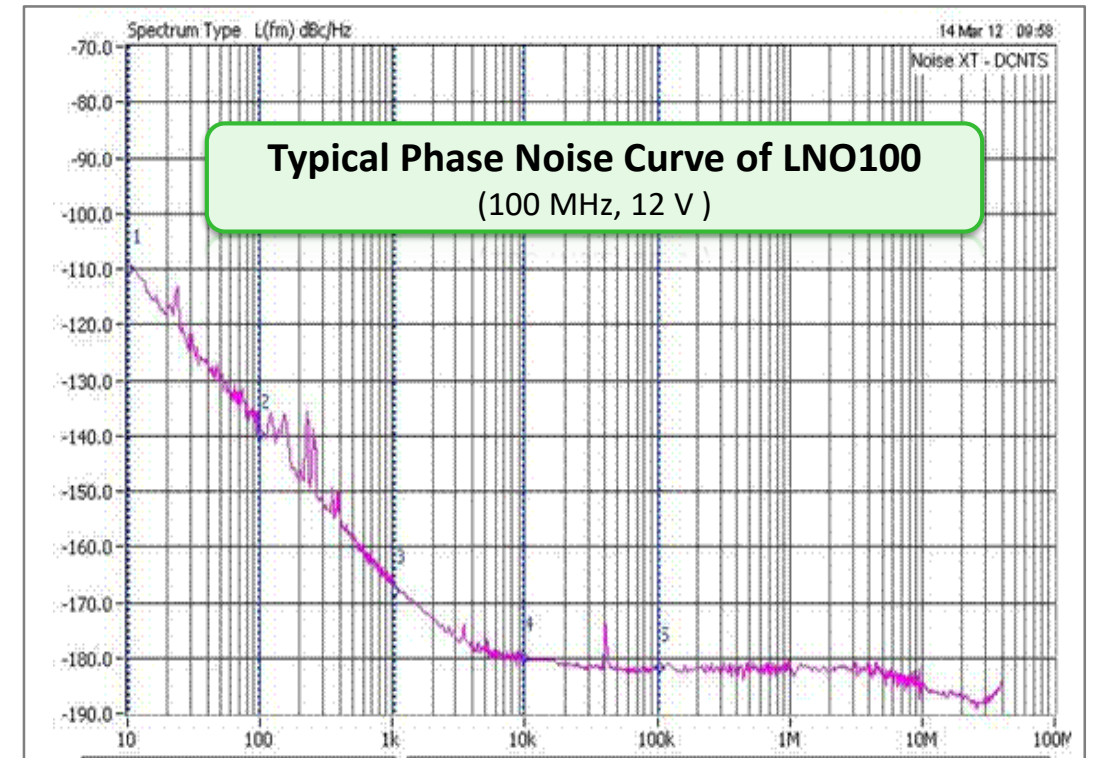
# Ultra Low Noise OCXO

## Applications:

- Test equipment, Simulator, Reference oscillator, Radar & Electronic Warfare systems

## Key Specifications:

Frequency	80 to 125 MHz
FvsT	± 0.5 ppm (-40 to +85°C)
Temperature range	-40 to +85°C
Ageing	± 0.5 ppm/1 year
<i>g</i> -Sensitivity	2 - 0.5 ppb/g (guaranteed)
Supply voltage	12 V, 15 V



<b>LNO100 - SMD1</b> (25 x 22 x 13 mm)	<b>LNO100 - PTH1</b> (38 x 38x 13 mm)	<b>LNO100 - PTH2</b> (38 x 25 x 13 mm)	<b>LNO100 - PTH3</b> (25 x 25 x 13 mm)	<b>LNO100 - PSS1</b> (38 x 38 x 25 mm)

# Ultra Low Noise SAW Oscillators (OCSO)



## Applications:

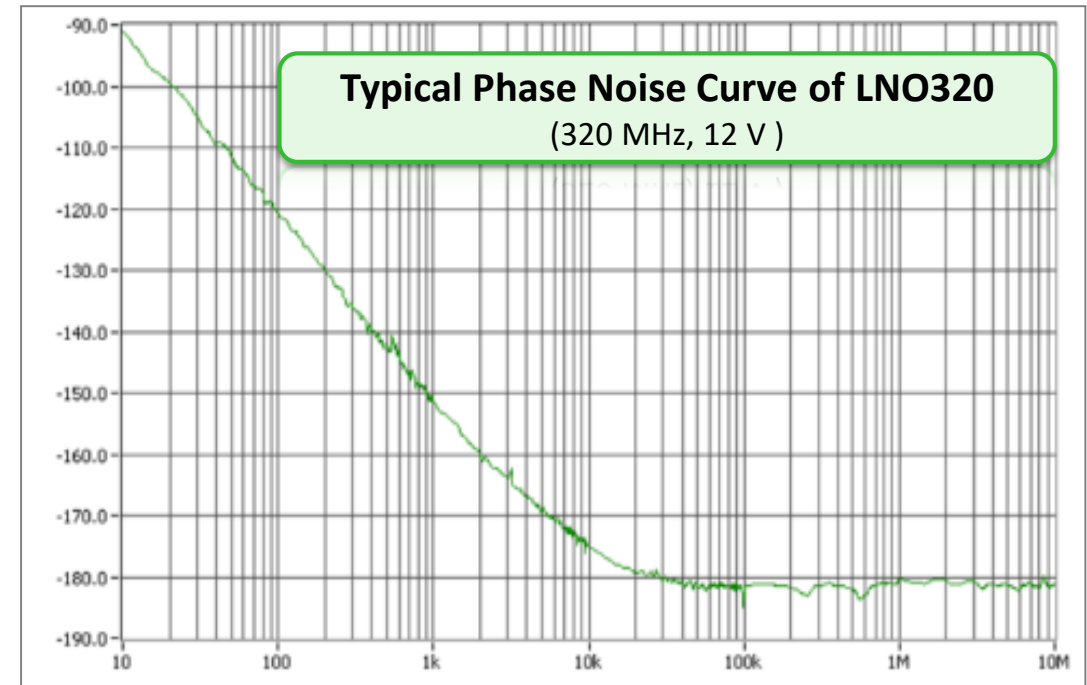
- Test equipment, Simulator, Reference oscillator, Radar & Electronic Warfare systems



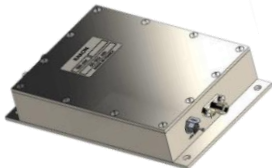


## Available Frequencies:

- 320, 480, 500, 640, 800, 960 MHz
- 1000, 1200, 1280, 2000, 3200, 4800, 5000 MHz
- Custom frequency upon request

## Features:

- Phase noise: -180 dBc/Hz at 100 kHz for 320 – 500 MHz
- Supply voltage: from 12V to 5V (for LNO – E1)
- g*-sensitivity: < 2 ppb/g (guaranteed)



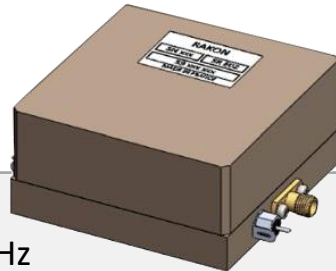
Instrumentation and Ground Systems				Airborne Systems
<p><b>LNO - B1</b> (95 x 76 x 23 mm)</p> 	<p><b>LNO - B2</b> (48 x 48 x 13 mm)</p> 	<p><b>LNO - B3</b> (120 x 76 x 23 mm)</p> 	<p><b>LNO - E1</b> (25 x 22 x 13 mm)</p> 	<p><b>LNO - D1</b> (70 x 70 x 35 mm)</p> 

# Shock Absorber OCSO – Grade D1

## Special Features:

- ❑ Automatic detection of the control input
- ❑ Internal shock absorbers
- ❑ Package: 70 x 70 x 35 mm

## Key Specifications:



### Frequencies

Fundamental : 320, 480, and 500 MHz  
 With internal doubler : 640, 960, and 1000 MHz

### High performance internal PLL

Free running :  $V_c = \text{Open}$   
 Voltage controlled :  $V_c = \text{DC voltage}$   
 Phase locked :  $V_c = 10 \text{ MHz ref}$

### Power supply

10 V

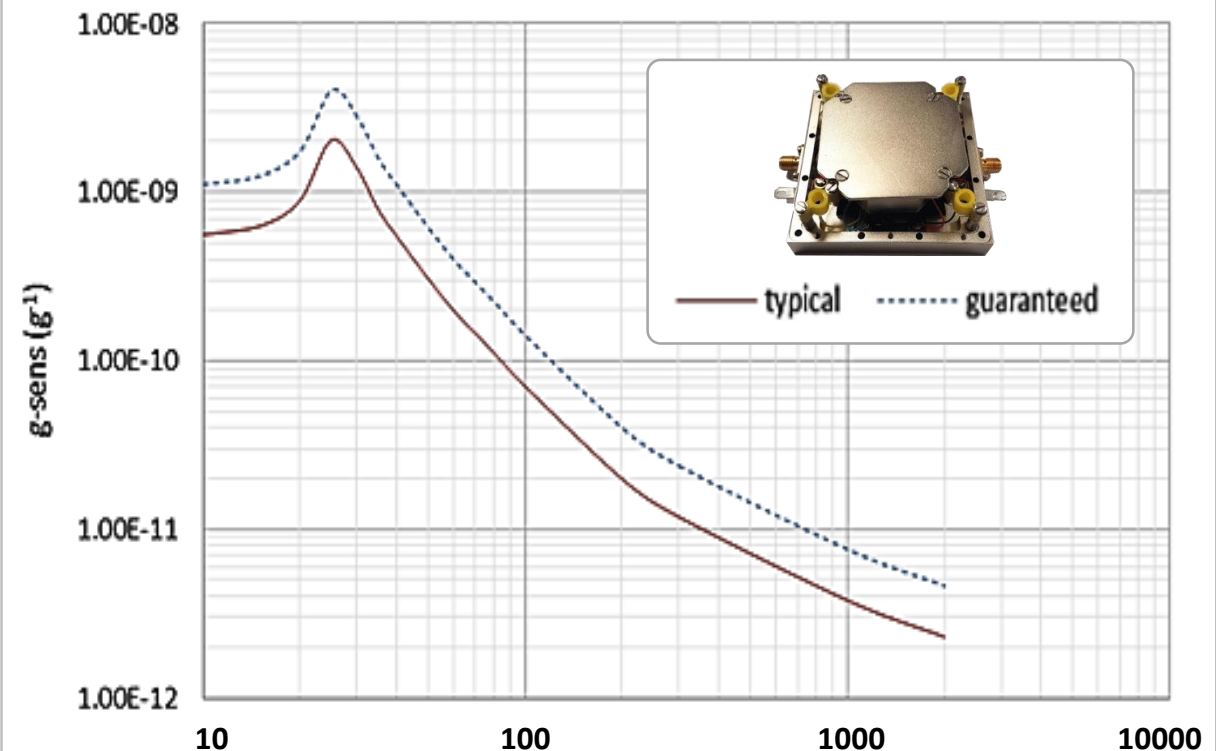
### Core oscillator intrinsic $g$ -sensitivity (each axis)

0.5 ppb/g typ., 1 ppb/g max.

### $g$ -sensitivity with vibration (each axis)

0.07 ppb/g typ., 0.14 ppb/g max. at 100 Hz  
 4 ppt/g typ., 8 ppt/g max. at 1000 Hz

## Shock Absorber OCSO $g$ -sensitivity

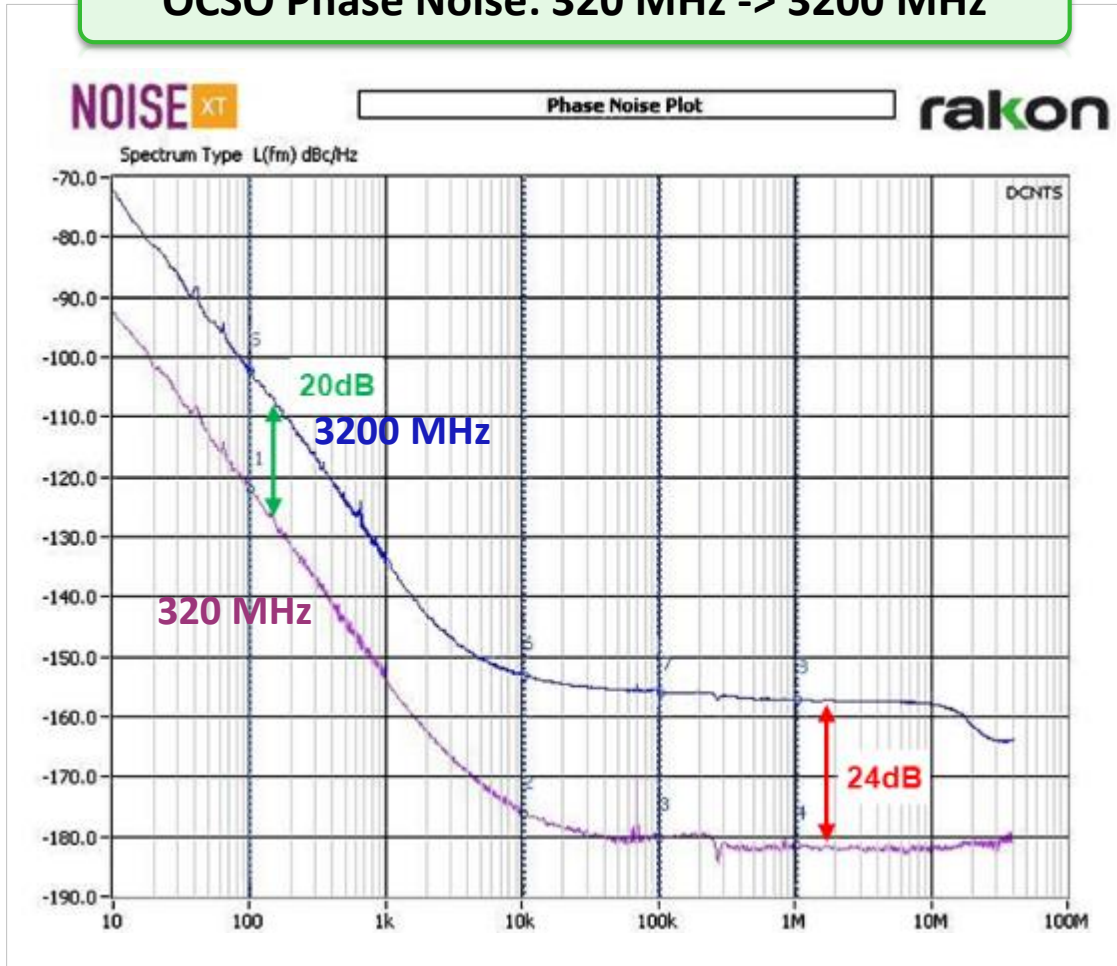




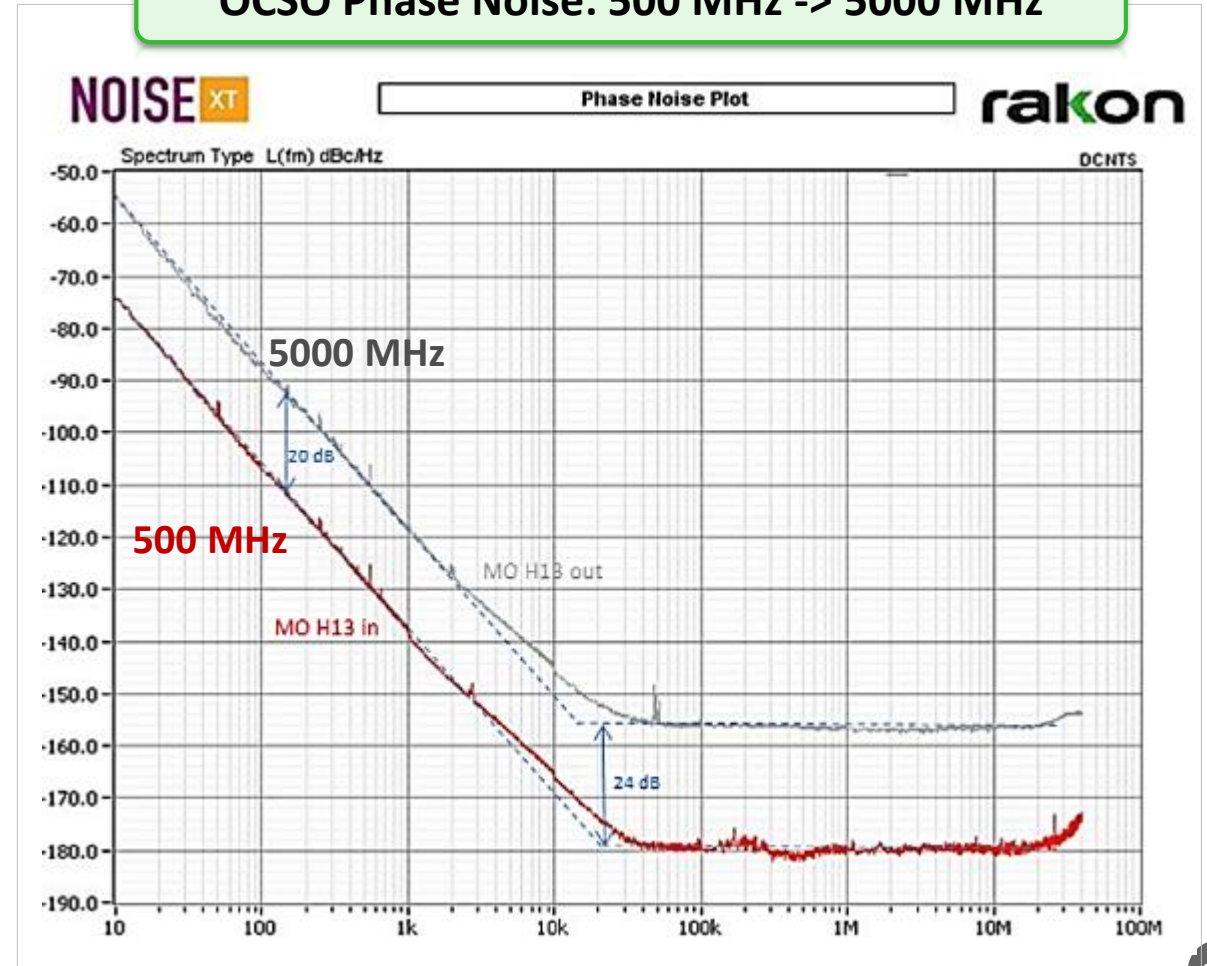
# Multiplied OCSO available up to 10 GHz

◀ OCSO at fundamental frequency + multiplier by 10

OCSO Phase Noise: 320 MHz -> 3200 MHz



OCSO Phase Noise: 500 MHz -> 5000 MHz

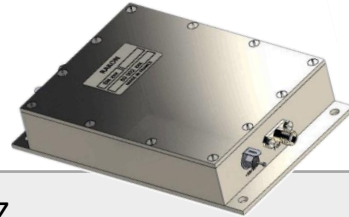


# OCSO in C and S Bands – Grade B3



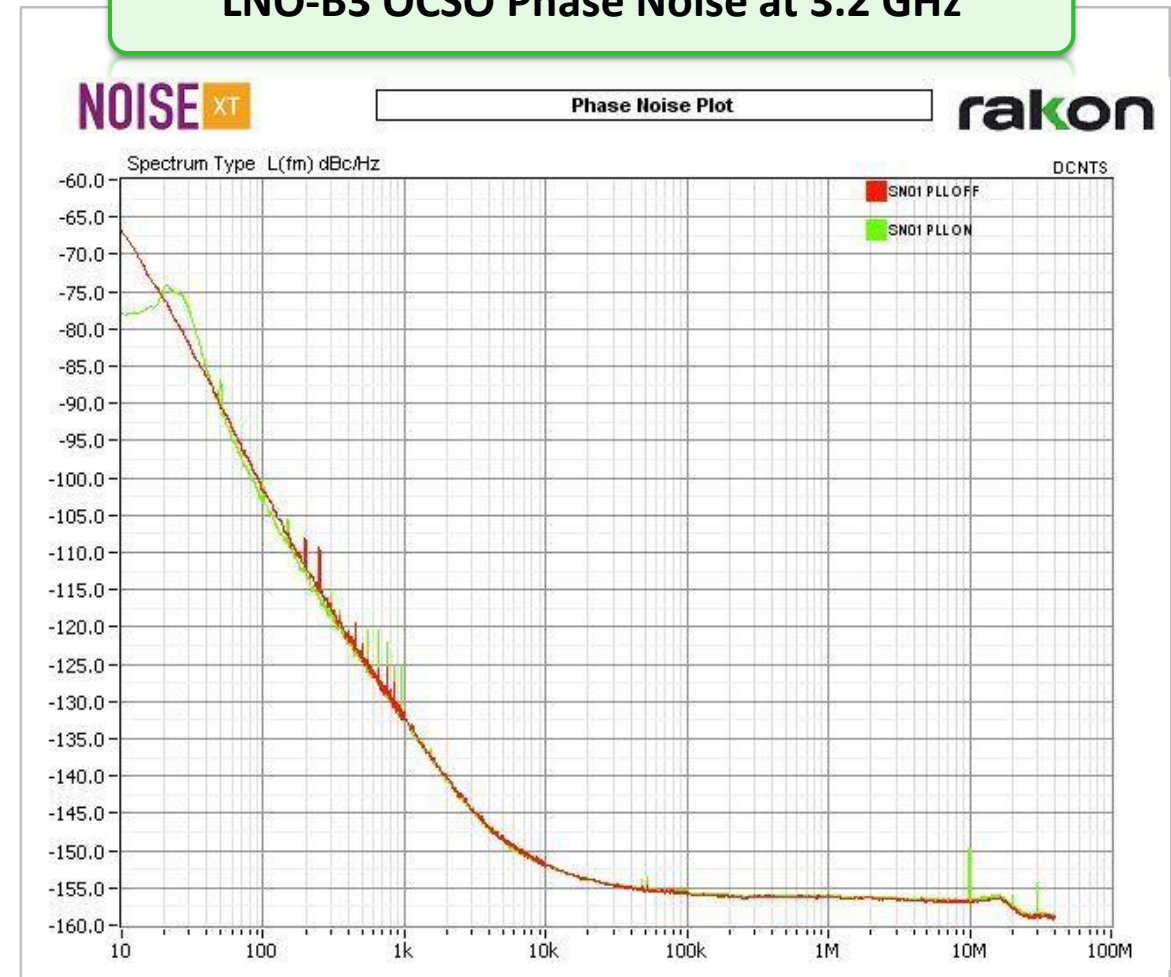
◀ Package: 120 x 76 x 23 mm

◀ Key Specifications



Frequency	3.2, 4.8, 5 GHz <i>(other frequencies up to 10 GHz upon request)</i>
Frequency multiplier	x 10
Fundamental frequency	320, 480 and 500 MHz
Phase Noise at 3.2 GHz	-130 dBc/Hz at 1 kHz -152 dBc/Hz at 10 kHz -157 dBc/Hz noise floor
Power supply	10 V
Option	Internal PLL to lock on external 10 MHz reference

## LNO-B3 OCSO Phase Noise at 3.2 GHz



# Defense Solutions – High Stability Oscillators



XO, TCXO, OCXO

LOW NOISE OSCILLATORS

HIGH STABILITY OSCILLATORS

SUB-SYSTEMS



APPLICATIONS: JET FIGHTERS, MISSILES, LAND & SEA-BASED RADARS, ELECTRONIC WARFARE SYSTEMS, UAVS

# Product Highlight – ROD5242T1



**Sampling**

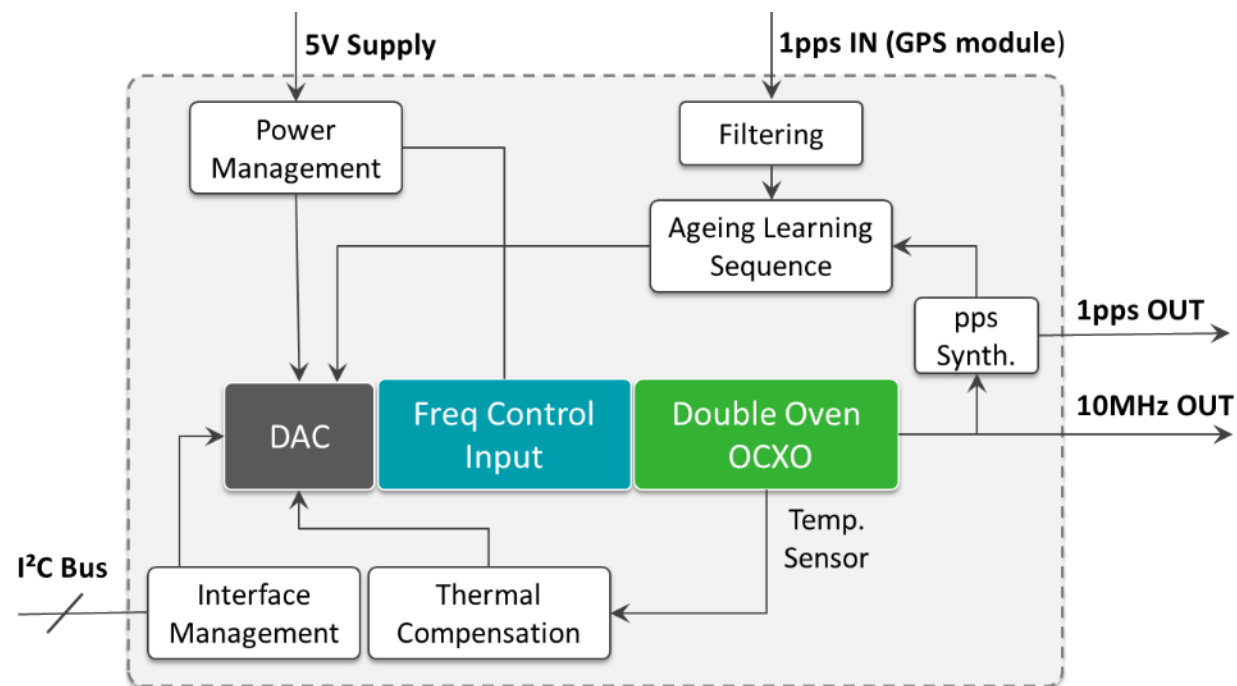
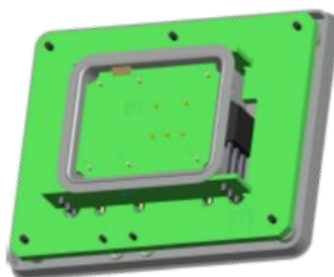
## GPS Disciplined OCXO



Product	Footprint	Standard Frequencies	Key Features
<b>ROD5242T1</b>	52 x 42 x 14 mm	10, 12.8, 20 MHz	<ul style="list-style-type: none"> <li>&lt; 0.1 ppb pk-pk</li> <li>&lt; 1.5 <math>\mu</math>s Holdover over &gt;24 hours with <math>\pm 10^{\circ}\text{C}</math> variation (10<math>^{\circ}\text{C}</math>/hour)</li> </ul>

### Key Features:

- ❑ 1 PPS
- ❑ Longest time keeping ability
- ❑ **1.5  $\mu$ s** holdover over 24 hours / up to **48h max.**
- ❑ Frequency Stability over full operating temperature range -40 $^{\circ}\text{C}$  to +85 $^{\circ}\text{C}$ 
  - ❑ **0.1 ppb peak to peak max**
  - ❑ **Less than 50ppt** typical over temp.
- ❑ **100ns** time holdover over 4hours
- ❑ **Low Ageing :**
  - ❑ < 0.1 ppb/day
  - ❑ < 0.3 ppm/10 years



# Ultra Stable Oscillator – HSO14



## HSO14 – State of the art in the short term stability domain

Ground USO in the  $10^{-14}$  short-term stability class



### Customer Benefits

- ❑ Fully compatible with the obsolete BVA product (OSA 8607)
- ❑ Excellent standalone reference with reduced calibration intervals
- ❑ Clean signal generation for frequency multiplication

### Application Benefits

- ❑ Frequency distribution for satellite ground stations
- ❑ Atomic fountain and other atomic frequency standards
- ❑ Test & measurement
- ❑ Network synchronisation

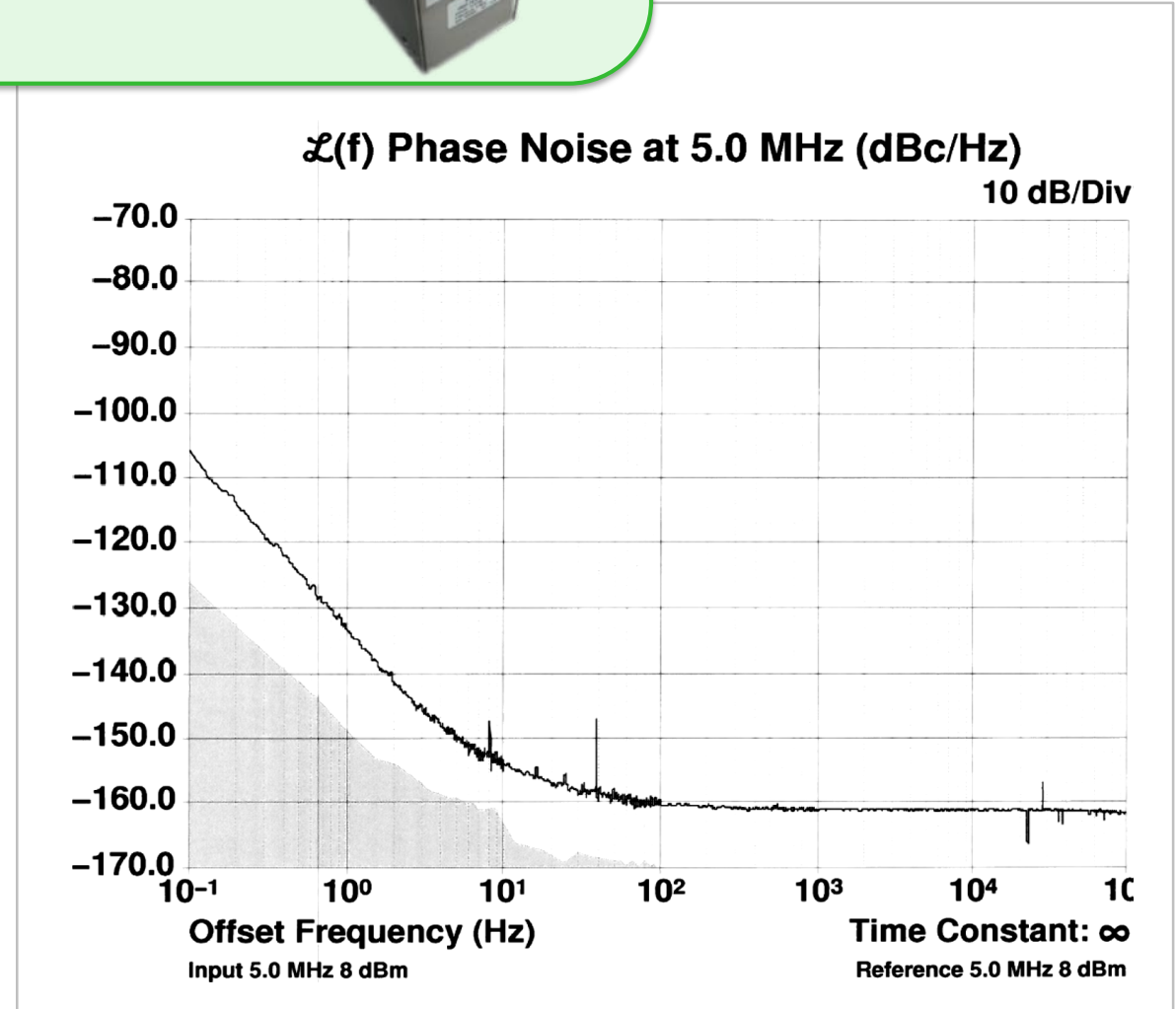
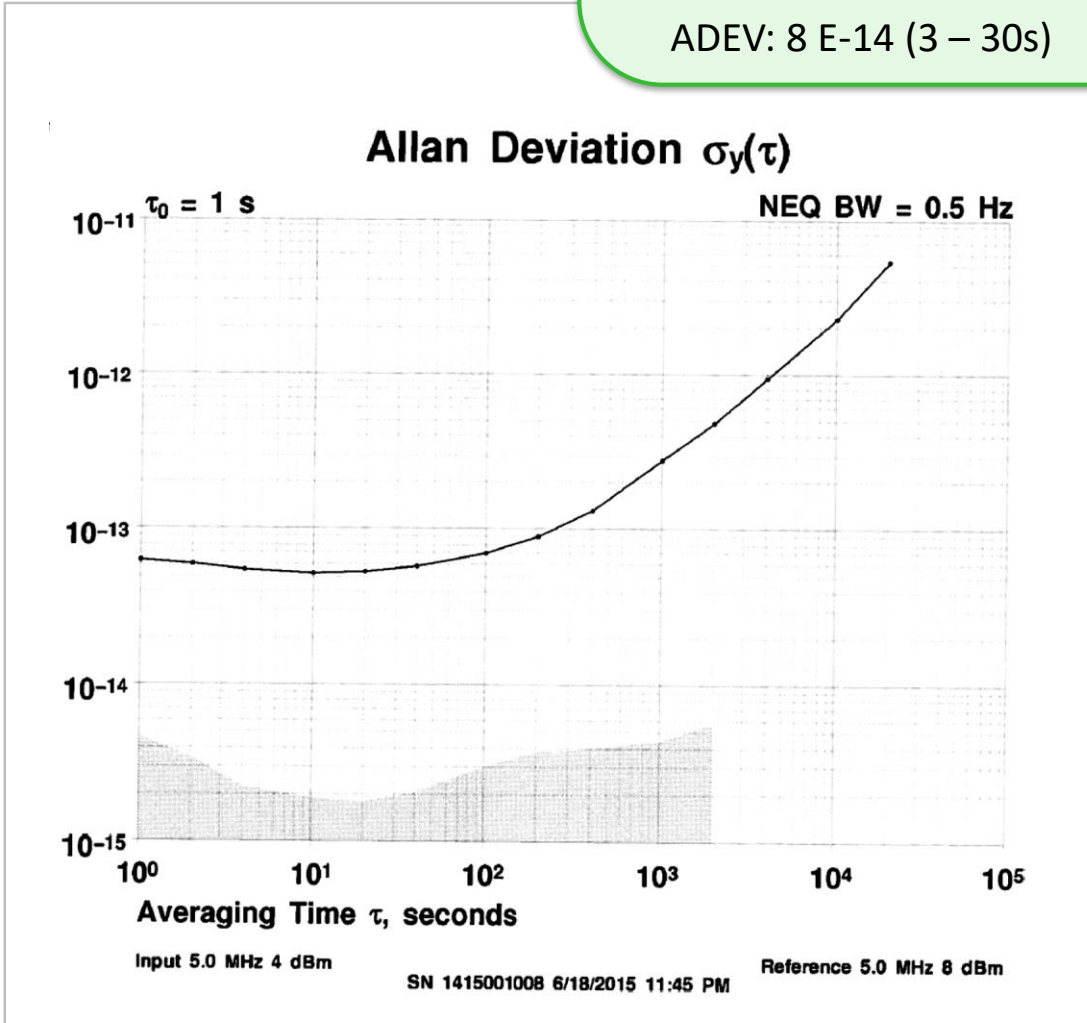
### Key Specifications

<b>Package</b>	73 x 135 x 84 mm (2.86"x5.33"3.32") Same as OSA 8607
<b>Frequency</b>	5 or 10 MHz
<b>FvsT</b>	± 0.05 ppb (0 to 50°C)
<b>ADEV (Allan Deviation)</b>	6 E-14 (3 – 30s)
<b>Ageing</b>	± 50 ppb/10 years
<b>Guaranteed Phase Noise at 5 MHz</b>	-130 dBc/Hz at 1 Hz -150 dBc/Hz at 10 Hz -160 dBc/Hz at 1 kHz

# HSO14 ADEV & Phase Noise Performance



**HSO14 Phase Noise at 5 MHz**  
 ADEV: 8 E-14 (3 – 30s)



# HSO14 ADEV



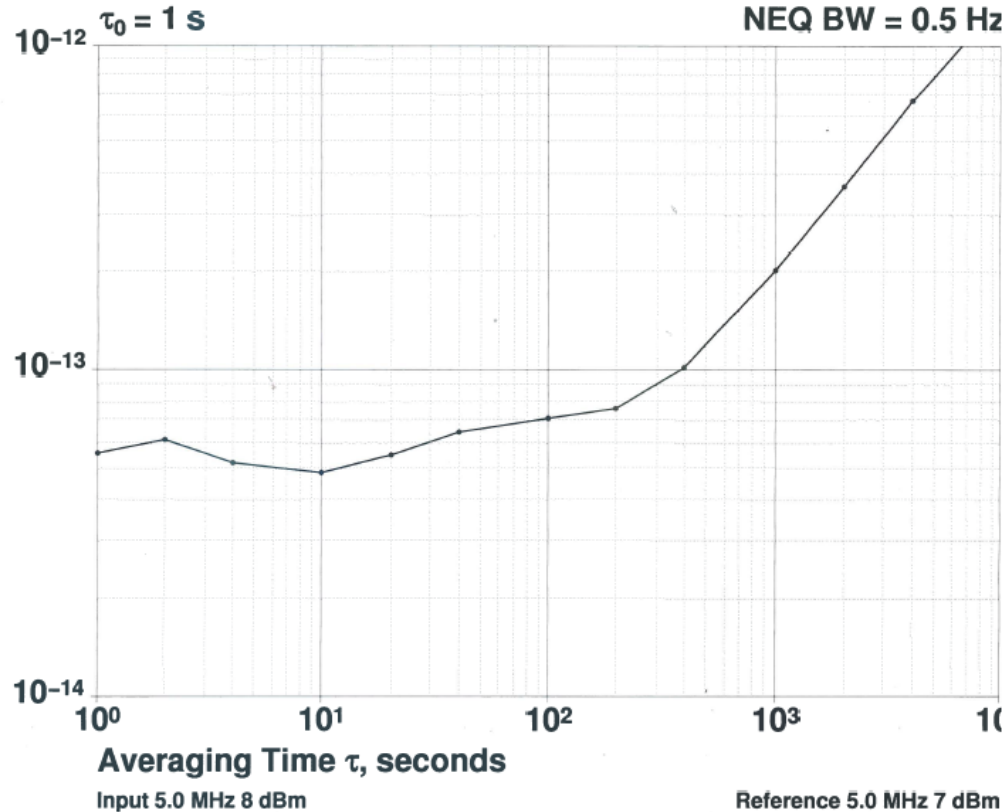
## HSO14 Phase Noise at 5 MHz

ADEV: 6 E-14 (3 – 30s)



15/06/1998 22:35:43  
3d 4h

Allan Deviation  $\sigma_y(\tau)$  Sym



## Allan Deviation $\sigma_y(\tau)$

Avg. Time (s)	Allan Deviation $\sigma_y(\tau)$	Noise Floor
1	5.566x10 <sup>-14</sup>	4.09541x10 <sup>-15</sup>
2	6.130x10 <sup>-14</sup>	5.11608x10 <sup>-15</sup>
4	5.176x10 <sup>-14</sup>	2.95787x10 <sup>-15</sup>
10	4.858x10 <sup>-14</sup>	1.53783x10 <sup>-15</sup>
20	5.477x10 <sup>-14</sup>	1.01540x10 <sup>-15</sup>
40	6.45x10 <sup>-14</sup>	9.77081x10 <sup>-16</sup>
100	7.10x10 <sup>-14</sup>	9.00561x10 <sup>-16</sup>
200	7.66x10 <sup>-14</sup>	7.91038x10 <sup>-16</sup>
400	1.026x10 <sup>-13</sup>	6.98856x10 <sup>-16</sup>
1000	2.02x10 <sup>-13</sup>	5.48106x10 <sup>-16</sup>
2000	3.69x10 <sup>-13</sup>	6.67350x10 <sup>-16</sup>
4000	6.7x10 <sup>-13</sup>	5.40582x10 <sup>-16</sup>
10000	1.34x10 <sup>-12</sup>	1.90149x10 <sup>-16</sup>
20000	2.1x10 <sup>-12</sup>	
40000	2.0x10 <sup>-12</sup>	
100000	1.2x10 <sup>-12</sup>	

$\tau_0 = 1 \text{ s}$  NEQ BW = 0.5 Hz

# Defense Solutions – Sub-Systems

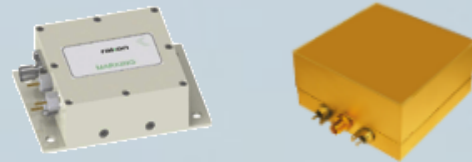
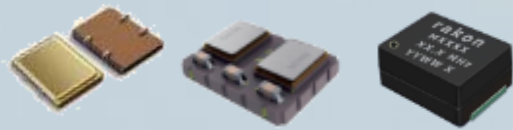


XO, TCXO, OCXO

LOW NOISE OSCILLATORS

HIGH STABILITY OSCILLATORS

SUB-SYSTEMS



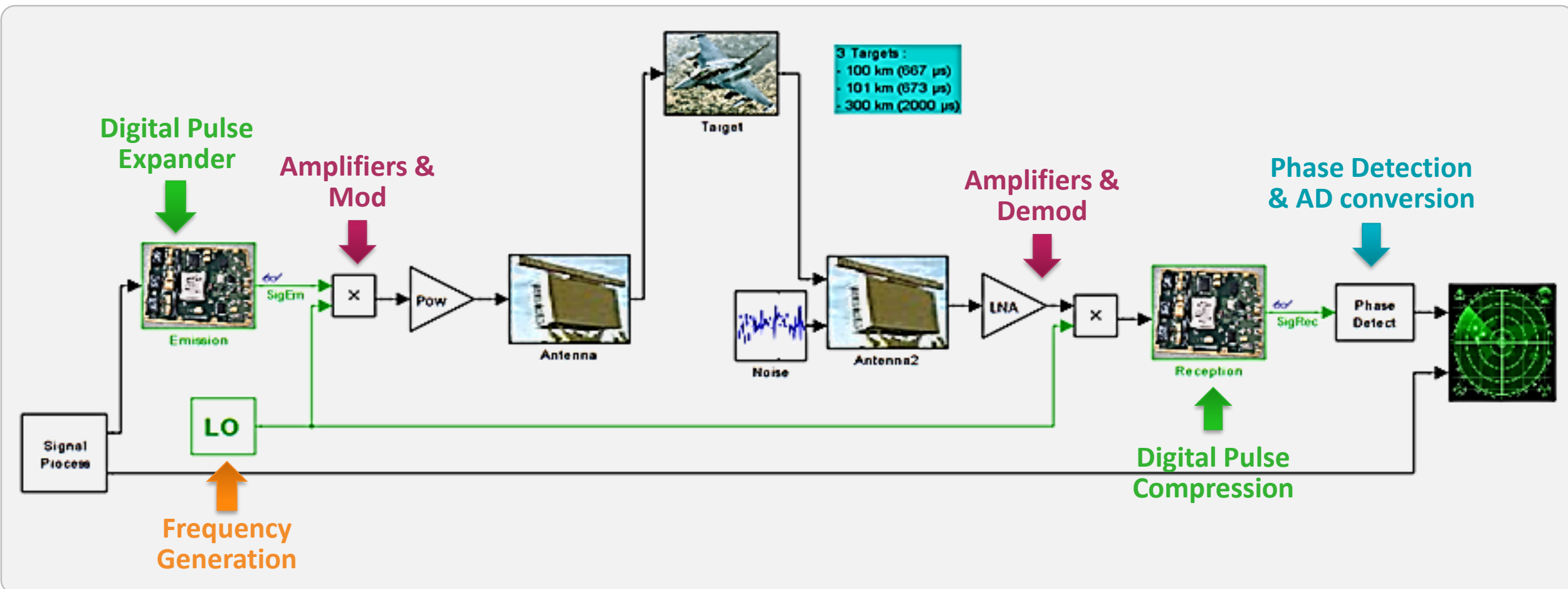
APPLICATIONS: JET FIGHTERS, MISSILES, LAND & SEA-BASED RADARS, ELECTRONIC WARFARE SYSTEMS, UAVS



# Radar Sub-Systems



- ◀ Rakon offers solutions to retrofit or upgrade existing radars, allowing an improvement in overall system performance and a service life extension



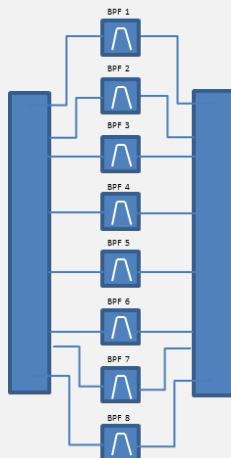
# RF Modules – Example of applications

◀ Capabilities up to 10 GHz for RF modules

◀ Examples:

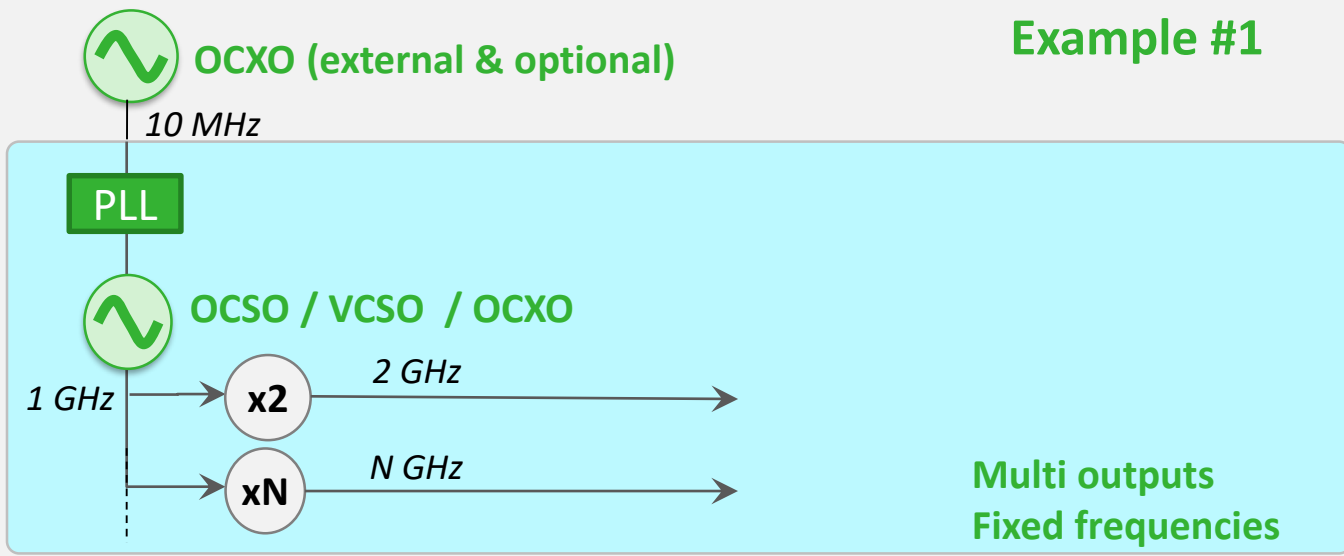
- ❑ Phase-Locked Dielectric Oscillator
- ❑ GPS Disciplined OCXO
- ❑ Transceivers for Mil Communications
- ❑ IF and RF filter banks

Filter banks

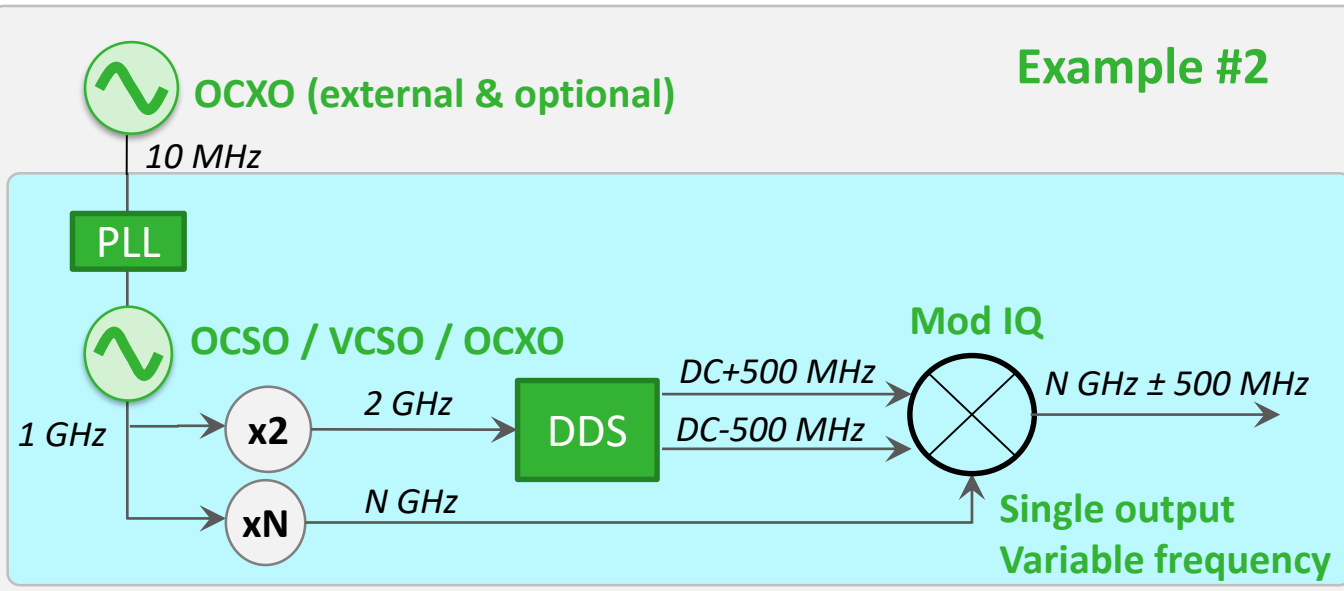


Example #3

Example #1



Example #2



# PLO Series – PLO-D

## The PLO-D

is a **Phase-Locked Dielectric Oscillator** dedicated to the defence market disciplined to an external or internal reference. It generates a 6 to 40 GHz frequency signal which gets its stability from the external reference. This PLO is recommended as a Local Oscillator RADAR, Communication Equipment.

## Key Features

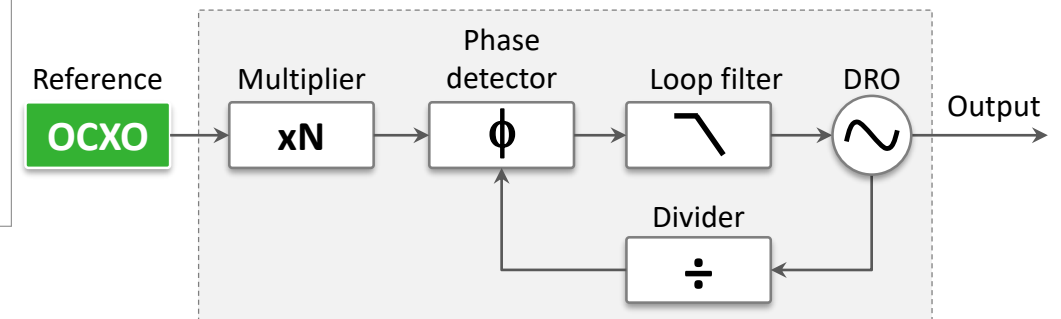
- ◀ Frequency outputs: 6 to 40 GHz
- ◀ Phase-locked to an ext. 10 or 100 MHz
- ◀ Operating temperature: 0 to 50°C
- ◀ DC power req.: 12 V @ 500 mA with OCXO
- ◀ Compact package: 57 x 57 x 16 mm

- ◀ RF connectors: SMA
- ◀ Output power: 14 dBm
- ◀ Phase noise @ 8 GHz (Typical):

Offset	8 GHz
100 Hz	-104 dBc/Hz
1 kHz	-125 dBc/Hz
10 kHz	-128 dBc/Hz
1 MHz	-138 dBc/Hz
10 MHz	-170 dBc/Hz

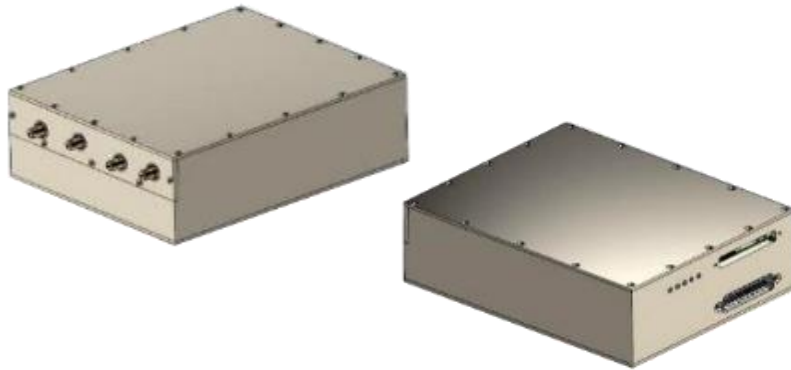
## Options

- ◀ Frequency of input reference
- ◀ Customized package
- ◀ Custom output level



Example of design

# Frequency Synthesizer Module – DS H01



## Features

- ❑ Standard DS H01 can go up to 6 GHz
- ❑ Semi-custom design (with DS H01 inside) can go up to Ku-band
- ❑ Plug and play implementation
- ❑ Waveform generator, highly flexible
- ❑ Modes: CW, chirp, list, pulse, burst
- ❑ Synchronization with other synthesizers
- ❑ Internal or External Clock references
- ❑ Package: 174 x 131 x 54 mm

## Key Specifications

Parameter	I/Q Outputs	RF Output
Outputs	2x (I/Q) or 1x RF	2x (I/Q) or 1x RF
Frequency	10 ~ 500 MHz	LO – 500 MHz ~ LO + 500 MHz with 2.5 GHz ≤ LO ≤ 3.5 GHz
SFDR	≥ 60 dBc	≥ 50 dBc
Phase noise	@ 500 MHz - @ 1 kHz - Floor	@ 3.5 GHz ≤ -120 dBc/Hz Typ. ≤ -145 dBc/Hz Typ.
Frequency step	7 μHz	
Freq. tuning agility	1 μs	
Output power	-10 dBm ~ 0 dBm, 1 dB steps	
Power consumption	~17 W	
Modes	CW, chirp, list, pulse, burst	
Programming	USB / SPI	

**Thank you for your attention**

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