RK508NS

The RK508NS is a NewSpace OCXO with excellent phase noise performance and low power consumption. It features Rakon's proven and highly successful proprietary Mercury+™ Integrated Circuit (IC) technology.

Providing a Total Ionizing Dose (TID) resistance of up to 30 krad, the MercuryR™ (Rad-Hard) ASIC was specifically developed to withstand the harsh radiation environment encountered in Traditional Space and NewSpace applications. Key advantages of IC-OCXOs over discrete oscillators are the smaller package size, lower power consumption, lower cost, shorter lead times and increased reliability because of the reduced number of components. The RK508NS is designed for lifetime missions of up to 12 years.

The standard frequencies of the RK508NS are 10 MHz, 10.23 MHz, 10.24 MHz, 40 MHz and 100 MHz. It is housed in a small, low-profile, hermetically sealed package of 22 x 22 x 13 mm. This means performance does not change under atmospheric pressure (atm) or vacuum. All testing is done at atmospheric pressure. The RK508NS can be adapted to large package sizes to fit specific PCB boards' layouts and requests.

Features

- Supply voltage: 3.3V / 5V
- Steady state consumption: 1.3 W max.
- Regulated voltage output available
- Assembly according to IPC A 610 Class 3
- Pulling range ±1 ppm typ.
- ADEV (1s): <5E-11 at 10 MHz
- Short lead time
- Output waveform: square or sine
- TID limit: 30 krad
- Latch-up free up to LET: 43 MeV.cm²/mg
- Small form factor and low mass
- Cost-effectiveness

Applications

- Frequency converters
- GNSS receivers
- Synthesizers

22 x 22 x 13 mm

Environmental Conditions

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Operating temperature	T_{OP}	-40	25	85	°C
Switch-on temperature	T_{SO}	-40	-	85	°C
Non-operating temperature	T_{NOP}	-40	-	105	°C
Random vibration	50 to 100 Hz: +6 dB/oct 100 to 1000 Hz: 0.6 g²/Hz 1000 to 2000 Hz: -6 dB/oct				
Shocks	Mechanical shock as per MIL-STD-202, Method 213: - Half sine with a peak acceleration of 2000 g for a duration of 0.5 msec				
Radiation	Total Ionizing Dose (TID) of 30 krad, low dose rate (36 to 360 rad/h) Latch up free up to LET = 43 MeV.cm²/mg				

Electrical Interface

Parameter	Condition / Remarks		Min.	Typ.	Max.	Unit
Power supply (Vcc)	3V option		3.14	3.3	3.46	V
	5V option		4.75	5	5.25	-
Load impedance	Sine wave		45	50	55	Ω
	Square	10 to 40 MHz 100 MHz	- -	- -	15pF//1kΩ 10pF//1kΩ	-
Control voltage (V_{CTRL})	-		0	-	V_{REF}	V
Reference voltage (V_{REF})	-		-	2.5	2.6	V_{REF}
Load of reference voltage	-		-	-	1	mA

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Screening Test

Parameter	Condition / Remarks	EM Option	FM Option
Ageing	At max operating temperature range	–	✓
Random acceleration	Level as per MIL-STD-202, Method 214, Condition I-D	–	✓
Thermal shocks	MIL-STD-202, Method 107, Condition A1	–	✓
Fine leak	MIL-STD-202, Method 112E, Condition C, Procedure IIIc	✓	✓
Gross leak	IEC 68-2-17, Test Qc, Method 1	✓	✓
Final measurement	MIL PRF 55310	✓	✓
External visual inspection	MIL-STD-883, Method 2009	✓	✓

Performances (10 to 40 MHz)

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency (Fn)	Standard Fn: 10, 10.23, 10.24 and 40 MHz	10	-	40	MHz
Initial frequency accuracy	PAtm, Rakon provides the control voltage to reach the frequency accuracy	-	-	±0.1	ppm
Freq. stability vs temperature	Referenced to +25°C	-	±0.1	±0.2	ppm
Freq. stability vs supply voltage	-	-	-	±0.01	ppm
Freq. stability vs load	-	-	-	±0.01	ppm
Freq. stability vs pressure	Atmosphere to vacuum	-	-	±0.2	ppm
Frequency pull range	Positive slope	±0.7	1	-	ppm
Freq. ageing (after 30 days of continuous operation)	1 year 5 years	-	-	±0.08 ±0.4	ppm
Allan standard deviation	Tau = 1s at 25°C	-	-	5E-11	-
Frequency warm-up	Time to be within the initial frequency. Accuracy compared to frequency after 1 hour at 25°C	-	-	5	mn
Output Waveform - Square					
Output voltage high (V_{OH})	-	2.4	-	-	V
Output voltage low (V_{OL})	-	-	-	0.5	V
Duty cycle	-	45	-	55	%
Rise time	10%-90% of V_{CC}	-	5	10	ns
Fall time	90%-10% of V_{CC}	-	5	10	ns
Output Waveform - Sine					
Output power	50Ω	3	-	7	dBm
Harmonics	DC to 1GHz	-	-	-25	dBc
Spurious	DC to 3GHz	-	-	-70	dBc
Warm-up supply power	-	-	-	3	W
Steady-state supply power	Under vacuum, at +25°C	-	0.8	1.3	W

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Performances (100 MHz)

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency (Fn)	Standard Fn: 100 MHz	-	100	-	MHz
Initial frequency accuracy	PAtm, Rakon provided the control voltage to reach the frequency accuracy	-	-	±0.1	ppm
Freq. stability vs temperature	Referenced to +25°C	-	±0.1	±0.2	ppm
Freq. stability vs supply voltage	-	-	-	±0.01	ppm
Freq. stability vs load	-	-	-	±0.01	ppm
Freq. stability vs pressure	Atmosphere to vacuum	-	-	±0.2	ppm
Frequency pull range	Positive slope	±0.7	1	-	ppm
Freq. ageing (after 30 days of continuous operation)	1 year 5 years	-	-	±0.7 ±1.5	ppm
Allan standard deviation	Tau = 1s at 25°C	-	-	5E-11	-
Frequency warm-up	Time to be within the initial frequency. Accuracy compared to frequency after 1 hour at 25°C	-	-	5	mn
Output Waveform - Square					
Output voltage high (V_{OH})	-	2.4	-	-	V
Output voltage low (V_{OL})	-	-	-	0.5	V
Duty cycle	-	45	-	55	%
Rise time	10%-90% of V_{CC}	-	3	5	ns
Fall time	90%-10% of V_{CC}	-	3	5	ns
Output Waveform - Sine					
Output power	50Ω	3	-	7	dBm
Harmonics	DC to 1GHz	-	-	-25	dBc
Spurious	DC to 3GHz	-	-	-70	dBc
Warm-up supply power	-	-	-	3	W
Steady-state supply power	Under vacuum, at +25°C	-	0.8	1.3	W

Phase Noise

Parameter	10, 10.23 & 10.24 MHz		40 MHz		100 MHz		Unit
	Typ.	Max.	Typ.	Max.	Typ.	Max.	
10 Hz offset	-	-115	-	-108	-90	-85	dBc/Hz
100 Hz offset	-	-130	-	-133	-120	-115	dBc/Hz
1 kHz offset	-	-140	-	-143	-140	-130	dBc/Hz
10 kHz offset	-	-150	-	-152	-150	-145	dBc/Hz
100 kHz and over offset	-	-155	-	-157	-152	-150	dBc/Hz

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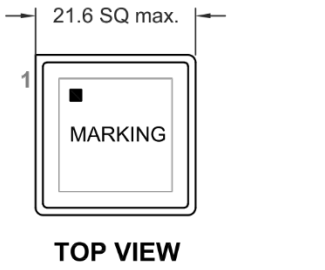
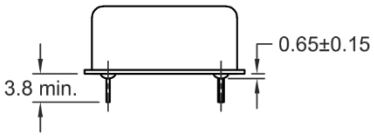
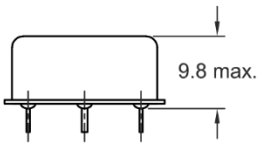
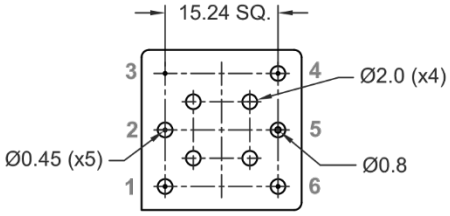
Model Outline and Pin Connections

Parameter	Remarks
Package size	22 x 22 x 13 mm. Pin through-hole package
Model outline	 TOP VIEW   FRONT VIEW  SIDE VIEW  BOTTOM VIEW
Net weight	10 g max.
STEP file	RK508NS 3D model *To open or view the STP file, you will need to import it into one of the following software programs: Autodesk Fusion 360, CATIA, SolidWorks, Solid Edge, TurboCAD, Kubotek KeyCreator, FreeCAD, ABViewer, ShareCAD, or eMachineShop.*

Pin	Connections	
1	Vs	Supply Voltage
2	OUT	RF Out
3	GND	Ground
4	Vc	Control Voltage
5	V_{REF}	Voltage Ref
6	NC	Not Connect (floating)

NOTE: Unit is mm. General tolerance ±0.2 mm.

Ordering Part Example

RK508NS 3 S EM 10M000000

Product Series
RK = Rakon
508 = Low PN and low power OCXO
NS = NewSpace

Supply voltage
3 = 3.3V, 5 = 5V

Output Waveform
S = Sine, SQ = Square

Model
EM = Engineering model
FM = Flight model

Frequency (Fn)*
10M000000 = 10 MHz

* Standard frequencies are 10, 10.23, 10.24, 40 and 100 MHz.

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