Space Oven Controlled Crystal Oscillator

RK508NS New Space

Product description

The RK508 NS is a cost effective using cots components, no screening will be applied to the components, a swept crystal will be used for this design. The RK508NS is a low power consumption Space OCXO dedicated to the New Space market (mini satellites and constellations) where tolerance to TID, low power consumption and a good phase noise are required for a mission of 5 years or less.

The RK508 NS platform is available at 10MHz, 10,23MHz, 10,24MHz, 40MHz and 100MHz as standard frequencies but can be adapted to any frequency from 10MHz to 125MHz. It is available in a small 22 x 22 x 13 mm package.

Remark: The package used for this design is hermetic, so under PA or Vacuum measurements are equivalent. All the tests are going to be done at atmospheric pressure.

Features

- Standard frequency: 100MHz
- Low profile 22 x 22 x 13mm
- Supply voltage: **+3,3V** or **+5V**
- Steady state consumption: 1.3W Max.
- Regulated voltage output available
- ROHS Compliant
- Assembly according to IPC A 610 Class 3
- Pulling range typ. ± 1 ppm
- ADEV (1s) < 5E-11 @ 100MHz
- Output wave form: **SQUARE** or **SINE**
- TID: 30krad
- Latch up free up to LET= 43 MeV.cm^2/mg

Applications

- Frequency converters
- GPS receivers
- Synthesizers

Specifications

Environmental conditions

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Operating Temperature	TOp	-40	25	+85	°C
Switch-on Temperature	TSo	-40	-	+85	°C
Non-Operating Temperature	TNOp	-40	-	+105	°C
Random Vibration (Specification to be confirmed)	20 to 50Hz: +6dB/oct 50 to 350Hz: 0.8g^2/Hz 350 to 2000Hz: -6dB/oct				
Shocks (Specification to be confirmed)	Mechanical shock as per MIL-STD-202, Method 213 Half sine with a peak acceleration of 2000g for duration of 0.5msec.				
Radiation	Total Ionizing Dose of 30krad, low dose rate (36 to 360rad/h) Latch up free up to LET = 43MeV.cm^2/mg				

Electrical interface

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Power Supply 3,3V	V_{CC}	3.14	3.3	3.46	V
Power Supply 5V	V_{CC}	4.75	5	5.25	V
Load Impedance SINE	-	45	50	55	Ω
Load Impedance SQUARE	// 1 kΩ	-	15	-	pF
Control Voltage	VCTRL	0	-	VREF	V
Vref Voltage	I max in mA			1	mA

Test

Screening Operation	Requirements & Conditions	OPTIONS		
		EM	FM Class B	FM Class S
Ageing	@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	√	√	√

Performance at 10MHz

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency	-	-	10	-	MHz
Initial Frequency Accuracy	PAtm, RAKON provide 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 Pulling Range	Positive slope	±0.7	±1	-	ppm
Freq. Ageing	After 30 days of continuous operation				
	Over 1 year	-	-	±0.08	ppm
	Over 5years	-	-	±0.4	ppm
Allan Standard Deviation	Tau = 1s @ 25°C	-	-	5E-11	-
Frequency Warm Up	Time to be within the init. Freq. Accuracy compared to freq. after 1h at 25°C	-	-	5	min
Phase Noise	@ 10Hz	-		-115	dBc/Hz
	@ 100Hz	-		-130	dBc/Hz
	@ 1kHz	-		-140	dBc/Hz
	@ 10kHz	-		-150	dBc/Hz
	@ 100kHz and over	-		-155	dBc/Hz
Output Waveform SQUARE	-	Square			
Output Voltage High Level SQUARE	V_{OH}	3	-	-	V
Output Voltage Low Level SQUARE	V_{OL}	-	-	0.5	V
Duty Cycle SQUARE	-	45	-	55	%
Rise Time SQUARE	10% - 90 % of Vcc		5	10	ns
Fall Time SQUARE	90% - 10 % of Vcc		5	10	ns
Output Waveform SINE	-	Sine			
Output Power SINE	50Ω	3		7	dBm
Harmonics SINE	DC to 1GHz	-	-	-25	dBc
Spurious SINE	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

Performance at 10,23MHz

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency	-	-	10,23	-	MHz
Initial Frequency Accuracy	PAtm, RAKON provide 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 Pulling Range	Positive slope	±0.7	±1	-	ppm
Freq. Ageing	After 30 days of continuous operation				
	Over 1 year	-	-	±0.08	ppm
	Over 5years	-	-	±0.4	ppm
Allan Standard Deviation	Tau = 1s @ 25°C	-	-	5E-11	-
Frequency Warm Up	Time to be within the init. Freq. Accuracy compared to freq. after 1h at 25°C	-	-	5	min
Phase Noise	@ 10Hz	-	-	-115	dBc/Hz
	@ 100Hz	-	-	-130	dBc/Hz
	@ 1kHz	-	-	-140	dBc/Hz
	@ 10kHz	-	-	-150	dBc/Hz
	@ 100kHz and over	-	-	-155	dBc/Hz
Output Waveform SQUARE	-		Square		-
Output Voltage High Level SQUARE	V_{OH}	3	-	-	V
Output Voltage Low Level SQUARE	V_{OL}	-	-	0.5	V
Duty Cycle SQUARE	-	45	-	55	%
Rise Time SQUARE	10% - 90 % of Vcc		5	10	ns
Fall Time SQUARE	90% - 10 % of Vcc		5	10	ns
Output Waveform SINE	-		Sine		-
Output Power SINE	50Ω	3	-	7	dBm
Harmonics SINE	DC to 1GHz	-	-	-25	dBc
Spurious SINE	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

Performance at 10,24MHz

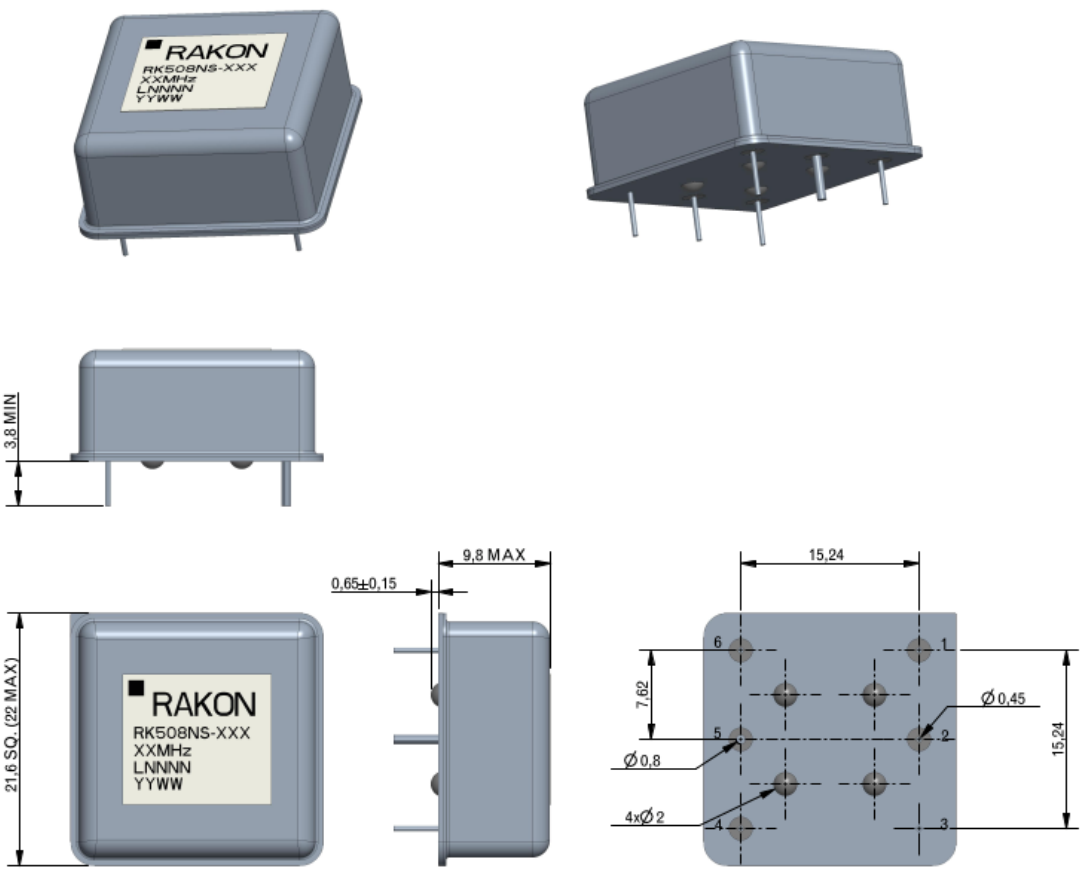
Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency	-	-	10,24	-	MHz
Initial Frequency Accuracy	PAtm, RAKON provide the control voltage to reach the frequency accuracy	-	-	±0.1	ppm
Freq. Stability vs Temperature	Referenced to +25°C	-	±0.1	±0.2	ppm
Freq. Stability vs Supply Voltage	-	-	-	±0.01	ppm
Freq. Stability vs Load	-	-	-	±0.01	ppm
Freq. Stability vs Pressure	Atmosphere to Vacuum	-	-	±0.2	ppm
Frequency Pulling Range	Positive slope	±0.7	±1	-	ppm
Freq. Ageing	After 30 days of continuous operation				
	Over 1 year	-	-	±0.08	ppm
	Over 5years	-	-	±0.4	ppm
Allan Standard Deviation	Tau = 1s @ 25°C	-	-	5E-11	-
Frequency Warm Up	Time to be within the init. Freq. Accuracy compared to freq. after 1h at 25°C	-	-	5	min
Phase Noise	@ 10Hz	-	-	-115	dBc/Hz
	@ 100Hz	-	-	-130	dBc/Hz
	@ 1kHz	-	-	-140	dBc/Hz
	@ 10kHz	-	-	-150	dBc/Hz
	@ 100kHz and over	-	-	-155	dBc/Hz
Output Waveform SQUARE	-		Square		-
Output Voltage High Level SQUARE	V_{OH}	3	-	-	V
Output Voltage Low Level SQUARE	V_{OL}	-	-	0.5	V
Duty Cycle SQUARE	-	45	-	55	%
Rise Time SQUARE	10% - 90 % of Vcc		5	10	ns
Fall Time SQUARE	90% - 10 % of Vcc		5	10	ns
Output Waveform SINE	-		Sine		-
Output Power SINE	50Ω	3	-	7	dBm
Harmonics SINE	DC to 1GHz	-	-	-25	dBc
Spurious SINE	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

Performance at 40 MHz

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency	-	-	40	-	MHz
Initial Frequency Accuracy	PAtm, RAKON provide 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 Pulling Range	Positive slope	±0.7	±1	-	ppm
Freq. Ageing	After 30 days of continuous operation				
	Over 1 year	-	-	±0.08	ppm
	Over 5years	-	-	±0.4	ppm
Allan Standard Deviation	Tau = 1s @ 25°C	-	-	5E-11	-
Frequency Warm Up	Time to be within the init. Freq. Accuracy compared to freq. after 1h at 25°C	-	-	5	min
Phase Noise	@ 10Hz	-	-	-108	dBc/Hz
	@ 100Hz	-	-	-133	dBc/Hz
	@ 1kHz	-	-	-143	dBc/Hz
	@ 10kHz	-	-	-152	dBc/Hz
	@ 100kHz and over	-	-	-157	dBc/Hz
Output Waveform SQUARE	-	Square			-
Output Voltage High Level SQUARE	V_{OH}	3	-	-	V
Output Voltage Low Level SQUARE	V_{OL}	-	-	0.5	V
Duty Cycle SQUARE	-	45	-	55	%
Rise Time SQUARE	10% - 90 % of Vcc		5	10	ns
Fall Time SQUARE	90% - 10 % of Vcc		5	10	ns
Output Waveform SINE	-	Sine			-
Output Power SINE	50Ω	3	-	7	dBm
Harmonics SINE	DC to 1GHz	-	-	-25	dBc
Spurious SINE	DC to 3GHz	-	-	-70	dBc
Warm-Up Supply Power	-	-	-	3	W
Steady State Supply Power	at +25°C	-	0.8	1.3	W

Performance at 100MHz

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency	-	-	100	-	MHz
Initial Frequency Accuracy	PAtm, RAKON provide 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 Pulling Range	Positive slope	±0.7	±1	-	ppm
Freq. Ageing	After 30 days of continuous operation				
	Over 1 year	-	-	±0.7	ppm
	Over 5years	-	-	±1.5	ppm
Allan Standard Deviation	Tau = 1s @ 25°C	-	-	5E-11	-
Frequency Warm Up	Time to be within the init. Freq. Accuracy compared to freq. after 1h at 25°C	-	-	5	min
Phase Noise	@ 10Hz	-	-106	-100	dBc/Hz
	@ 100Hz	-	-126	-120	dBc/Hz
	@ 1kHz	-	-140	-130	dBc/Hz
	@ 10kHz	-	-150	-145	dBc/Hz
	@ 100kHz and over	-	-152	-150	dBc/Hz
Output Waveform SQUARE	-	Square			-
Output Voltage High Level SQUARE	V_{OH}	3	-	-	V
Output Voltage Low Level SQUARE	V_{OL}	-	-	0.5	V
Duty Cycle SQUARE	-	45	-	55	%
Rise Time SQUARE	10% - 90 % of Vcc		5	10	ns
Fall Time SQUARE	90% - 10 % of Vcc		5	10	ns
Output Waveform SINE	-	Sine			-
Output Power SINE	50Ω	3	-	7	dBm
Harmonics SINE	DC to 1GHz	-	-	-25	dBc
Spurious SINE	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



PIN	SYMBOL	FUNCTION
1	Vs	Supply Voltage
2	OUT	R Output
3	GND	Ground
4	Vc	Voltage Control
5	Vref	Voltage Ref
6	NC	To be not connected at any potential (Floating)

	A	CREATION DU PLAN	C.BUNEL	06/04/2024	
N° DMD	REV	MODIFICATIONS	AUTEUR	DATE	VISA
MATIERE / MATERIAL		SPEC. USINAGE / MANUFACTURING		UNITE / UNIT mm	
TRAITEMENT / TREATMENT		FINITION / PLATING *All pins hot dipped with Pure Tin coating over Ni underlayer*	TOL GENE ±0.1mm	RAKON Parc d'affaires « Carré 92 » Bâtiment G3 10 Avenue des Louvresses 92230 Gennevilliers	
Nom du fichier plan RK508		Nom du modèle 3D RK508 / Format papier A4 V	ECH / SCALE 2,000		
DESIGNATION RK508NS WITH CF overall dimensions			N° PLAN		REV A
N° ARTICLE				Page 1/1	

Table of modification

PAGE	REV	DESCRIPTION OF MODIFICATIONS (see change bars in margin)	DATE
all	01	ECO C59723	26/04/23