

RK105 5032

The RK105 is a radiation tolerant NewSpace XO in a 5.0 x 3.2 mm hermetically sealed SMD package. Low RMS jitter (0.9 ps, integrated 12 kHz to 20 MHz), tight frequency stability (± 30 ppm over -40°C to 85°C), and extended operating temperature from -55°C up to 125°C (Option M) are attractive features of this XO. CMOS, LVDS or LVPECL output options are available depending on the application, as well as different types of FM screening options.

The small form factor RK105 XO is specifically designed for missions where resistance to demanding Low Earth Orbit (LEO) environments is required. This NewSpace XO is a cost-effective COTS solution with a short lead time.

Features

- Free from export restrictions
- TID limit of 72/100 krad
- Latch-up free till 32.4/62 MeV.cm²/mg
- Hermetically sealed package
- Frequency range: 8 – 1500 MHz

Applications

- Missions where TID limit of 72/100 krad and latch-up free till 32.4/62 MeV.cm²/mg are required
- Rugged environment

5.0 x 3.2 x 1.2 mm



1. Environmental Conditions

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Operating temperature	Option I: -40°C to 85°C Option M: -55°C to 125°C	-40 -55	25 25	85 125	$^{\circ}\text{C}$
Switch-on temperature	TS_0	-55	-	125	$^{\circ}\text{C}$
Non-operating temperature	TN_{Op}	-55	-	125	$^{\circ}\text{C}$
Mechanical shock	MIL-STD-883, Method 2002 (1500 g, 0.5 ms)				
Humidity	After 48 hours at $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 85% relative humidity non-condensing				
Temperature cycling	MIL-STD-883, Method 1010.8 (-55°C , $+125^{\circ}\text{C}$, 1000 cycles)				
Vibration	MIL-STD-883, Method 2007 (20 g, 3 different axis, 4 times)				
Gross and fine leak	MIL-STD-883, Method 1014				
RoHS compliant	Yes				
Radiation: Products have been tested up to the following levels without any events					
		TID (LDR as per ESICC22900)	SEL (MeV.cm ² /mg)	SET (MeV.cm ² /mg)	SEFI (MeV.cm ² /mg)
	CMOS	100 krad	32.4	20	62.5
	LVDS	72 krad	32.4	10	62.5
	LVPECL	72 krad	62.5	10	62.5

2. Frequency Characteristics

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
AFD ¹ option	Option I: -40°C to 85°C Option M: -55°C to 125°C	-	-	± 50 ± 75	ppm
Initial frequency accuracy (FvT ² option)	-	-	-	± 15	ppm
Frequency stability over temperature (FvT)	Option I: -40°C to 85°C Option M: -55°C to 125°C	-	-	± 30 ± 50	ppm
Supply voltage stability (FvT)	Over operating temperature	-	-	± 3	ppm
Load sensitivity (FvT)	Over operating temperature	-	-	± 5	ppm
Ageing (FvT)	Over 10 years	-	-	± 15	ppm
Start-up time	-	-	-	10	ms

¹ AFD: Absolute Frequency Drift. It includes initial accuracy + temperature range + supply variation + load variation + ageing over 10 years.

² FvT: Frequency vs. Temperature.

3. Electrical Interface

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Power supply (V _{DD})	Option 2: 2.5 V Option 3: 3.3 V	2.375 2.97	2.5 3.3	2.625 3.63	V
Stead state input current power	CMOS output: LVDS output LVPECL output	-	20 23 54	-	mA

4. Output Characteristics – CMOS³

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency	CMOS output	8	-	200	MHz
Output voltage (V _{OL})	15pf load	-	-	10% V _{DD}	V
Output voltage (V _{OH})	15pf load	90% V _{DD}	-	-	V
Duty cycle	@50% V _{DD}	48	-	52	%
Rise time / Fall time	90% to 10% V _{CC}	-	-	3	ns
RMS phase jitter	Integrated 12 kHz to 20 MHz	-	0.9	2.5	ps

5. Output Characteristics – LVPECL

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency	LVPECL output	8	-	1500	MHz
Output voltage (V _{OL})	50Ω nominal load	-	-	V _{DD} – 1.6V	V
Output voltage (V _{OH})	50Ω nominal load	V _{DD} – 1.03V	-	-	V
Duty cycle	@ V _{DD} – 1.03V (45 to 55% over 600 MHz)	48	-	52	%
Rise time / Fall time	80% to 20% V _{CC}	-	-	0.6	ns
RMS phase jitter	Integrated 12 kHz to 20 MHz	-	0.9	2.5	ps

6. Output Characteristics – LVDS

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency	LVDS output	8	-	1500	MHz
Output voltage	Voltage swing (V _{OD})	-	350	-	mV
Duty cycle	Measured @ 1.25 V (45 to 55% over 150 MHz)	48	-	52	%
Rise time / Fall time	RL = 100 Ω / CL = 10 pF	-	-	0.6	ns
RMS phase jitter	Integrated 12 kHz to 20 MHz	-	0.9	2.5	ps

³ The CMOS output is TTL compatible with the 3.3 V supply voltage.

7. Screening Options

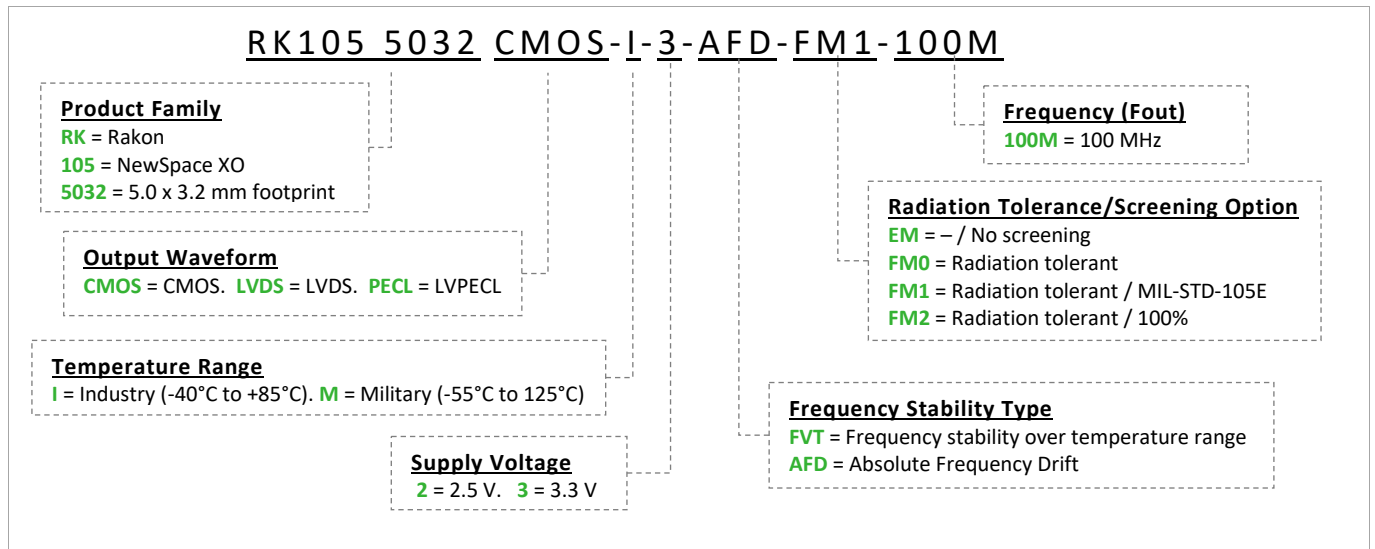
Screening Operation	Requirements and Condition	Options			
		EM	FM0	FM1	FM2
Stabilization bake (prior to seal)	MIL-STD-883 method 1008, conduction C	-	24h@150°C	24h@150°C	24h@150°C
Thermal shocks	Option I: MIL-STD-202, Method 107-I, Condition A1	-	✓	✓	✓
	Option M: MIL-STD-202, Method 107-I, Condition B1	-	✓	✓	✓
Temperature cycling	Option I: MIL-STD-883, method 1010, condition A	-	✓	✓	✓
	Option M: MIL-STD-883, method 1010, condition B	-	✓	✓	✓
Constant acceleration	MIL-STD-883, method 1010, condition A Acceleration: 5000 g, curing 60 s in direction Y1	-	✓	✓	✓
PIND test	MIL-STD-883, method 2020, condition B	✓	✓	✓	✓
Seal test	Fine leak: MIL-STD-883, method 1014, condition A2	✓	✓	✓	✓
	Gross leak: CEI 68-2-17 Test Qc, Method 1	✓	✓	✓	✓
Pre burn-in measurement	Following the guidelines of MIL-PRF-55310, §4.8.5, §4.8.6, §4.8.11, and §4.8.20	✓ ⁴	✓ ⁵	✓ ⁵	✓
Burn-in	Temperature: +125 °C Pressure: Patm Supply Voltage: V _{CC} nom Load: Load nom	-	-	160h min.	160h min.
Post burn-in measurement	Following the guidelines of MIL-PRF-55310	-	-	✓	✓
PDA	-	-	-	20%	10%
External visual Inspection	MIL-STD-883, Method 2009	-	-	✓	✓

⁴ Electrical verification.

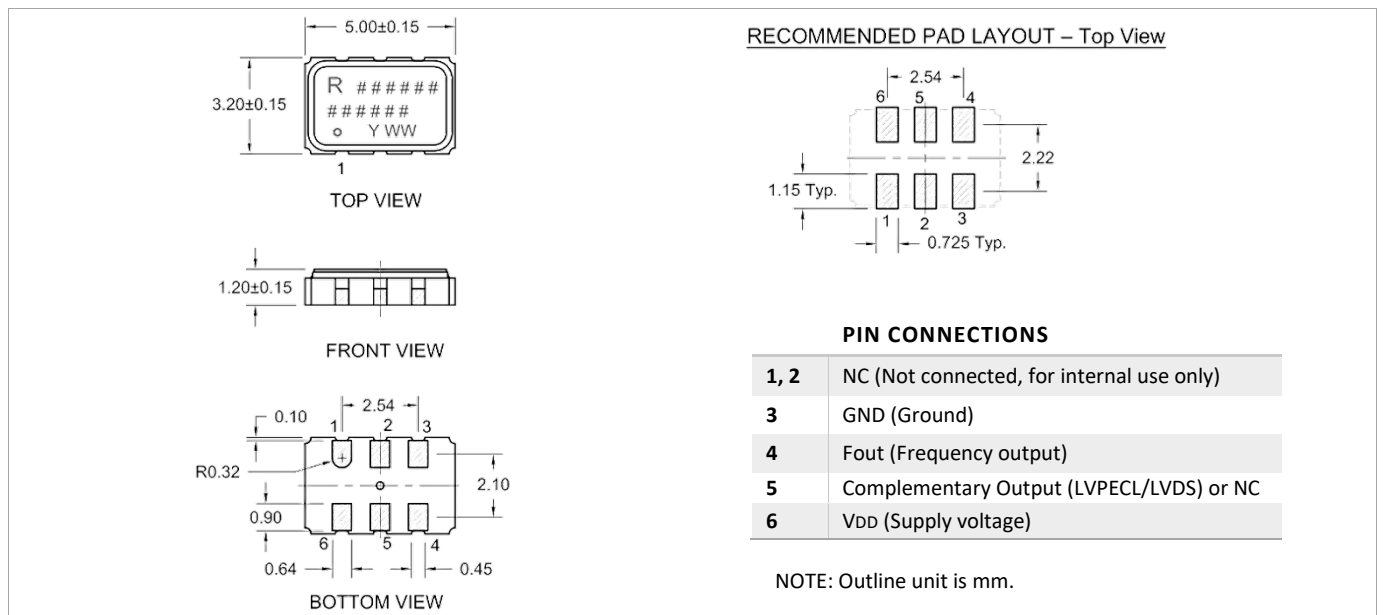
⁵ MIL-STD-105E general inspection level | AQL level 1.0.

► 100 pcs batch: test on 13 pcs / 0 rejected. ► 500 pcs batch: test on 20 pcs / 0 reject accepted. ► 1000 pcs batch: test on 50 pcs / 1 reject accepted.

8. Ordering Part Example



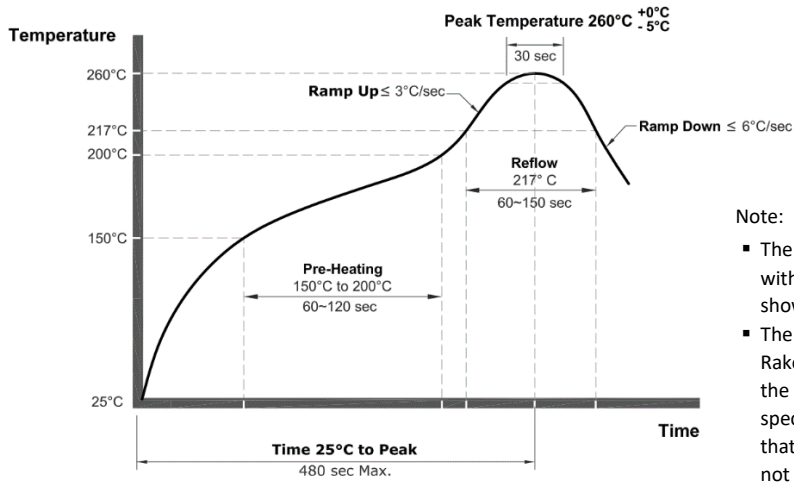
9. Model Outline, Pin Connections and Recommended Pad Layout



10. Marking

Parameter	Test Condition / Description	Marking
Top line	[R #####] R and part identifier	
Middle line	[#####] Part information	
Bottom line	[o YWW] Pin 1, Year code* and Week code** Year code*: A = 2010, B = 2011, C = 2012, D = 2013, Z = 2035 Week code**: WW = 01 = Week of first Monday of the year	

11. Manufacturing Information

Parameter	Test Condition / Description
Packaging description	<300 pcs: Cut-tape >300 pcs: Tape and reel. Standard packing quantity is 2000 pcs/reel
Pb-free reflow profile	 Note: ▪ The product has been tested to withstand the Reflow Profile shown on the left hand side. ▪ The reflow profile used to solder Rakon products is determined by the solder paste manufacture's specification. It is recommended that the reflow profile use does not exceed the one on the left.