

## RK105 5032

This radiation tolerant 5 x 3.2 mm hermetically sealed SMD XO is specifically designed for missions where resistance to demanding environment, short lead-time and radiation tolerance are required. It combines a very low RMS phase jitter, tight frequency stability and is available with different types of FM screening options.

### Features

- Free from export restrictions
- TID limit of 72/100 kRad and latch-up free till 32.4/62 MeV
- Hermetically sealed package
- Frequency range: 8-1500 MHz
- Low consumption: 30 mA
- Supply voltage: 2.5 or 3.3 V
- AFD<sup>1</sup> ±50 ppm over -40°C to +85°C
- Different screening options

### Applications

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

### 5.0 x 3.2 mm



## 1. Environmental Conditions

| Parameter   | Condition / Remarks  | Min.                        | Typ.                          | Max.                          | Unit                           |
|---|--|-----------------------------|-------------------------------|-------------------------------|--------------------------------|
| Operating temperature   | Option I: -40°C to 85°C<br>Option M: -55°C to 125°C              | -40<br>-55                  | 25<br>25                      | 85<br>125                     | °C                             |
| Switch-on temperature   | TS <sub>0</sub>  | -55                         |                               | 125                           | °C                             |
| Non-operating temperature   | TNO <sub>p</sub>   | -55                         |                               | 125                           | °C                             |
| Mechanical shock  | MIL-STD-883, Method 2002 (1500 g, 0.5 ms)                        |                             |                               |                               |                                |
| Humidity  | After 48 hours at 85°C ±2°, 85% relative humidity non-condensing |                             |                               |                               |                                |
| Temperature cycling   | MIL-STD-883, Method 1010.8 (-55°C, +125°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:<br>Products have been tested up to the following levels without any events |  |                             |                               |                               |                                |
|   |  | TID (LDR as per ESICC22900) | SEL (MeV/mg/cm <sup>2</sup> ) | SET (MeV/mg/cm <sup>2</sup> ) | SEFI (MeV/mg/cm <sup>2</sup> ) |
|   | 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 <sup>1</sup> option                              | Option I: -40°C to 85°C<br>Option M: -55°C to 125°C |      |      | ±50<br>±75 | ppm  |
| Initial frequency accuracy (FVT <sup>2</sup> option) |   |      |      | ±15        | ppm  |
| Frequency stability over temperature (FVT)           | Option I: -40°C to 85°C<br>Option M: -55°C to 125°C |      |      | ±30<br>±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   |

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

<sup>2</sup> FVT: Frequency Vs. Temperature.

### 3. Electrical Interface

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

### 4. Output Characteristics – CMOS<sup>3</sup>

| Parameter                         | Condition / Remarks         | Min.                | Typ. | Max.                | Unit |
|-----------------------------------|-----------------------------|---------------------|------|---------------------|------|
| Nominal frequency                 | CMOS output                 | 8                   |      | 200                 | MHz  |
| Output voltage (V <sub>OL</sub> ) | 15pf load                   |                     |      | 10% V <sub>DD</sub> | V    |
| Output voltage (V <sub>OH</sub> ) | 15pf load                   | 90% V <sub>DD</sub> |      |                     | V    |
| Duty cycle                        | @50% V <sub>DD</sub>        | 48                  |      | 52                  | %    |
| Rise time / Fall time             | 90% to 10% V <sub>cc</sub>  |                     |      | 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 <sub>OL</sub> ) | 50Ω nominal load                                      |                         |      | V <sub>DD</sub> – 1.6V | V    |
| Output voltage (V <sub>OH</sub> ) | 50Ω nominal load                                      | V <sub>DD</sub> – 1.03V |      |                        | V    |
| Duty cycle                        | @ V <sub>DD</sub> – 1.03V<br>(45 to 55% over 600 MHz) | 48                      |      | 52                     | %    |
| Rise time / Fall time             | 80% to 20% V <sub>cc</sub>                            |                         |      | 0.6                    | ns   |
| RMS Phase Jitter                  | Integrated 12 kHz to 20 MHz                           |                         | 0.9  | 2.5                    | ps   |

### 6. Output Characteristics – LVDS

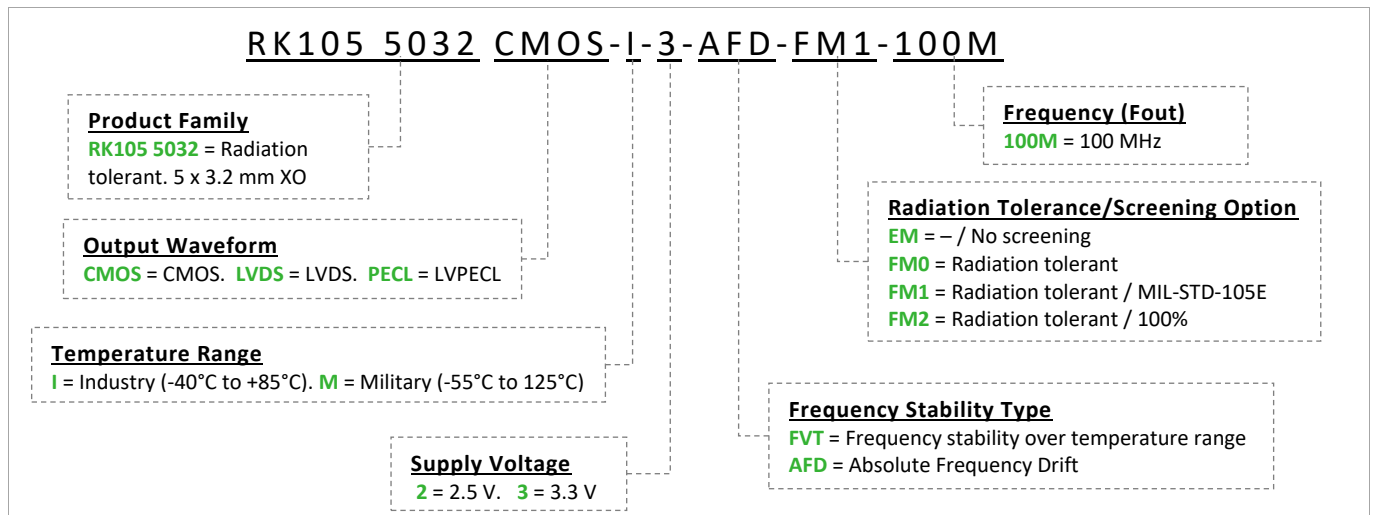
| Parameter             | Condition / Remarks                           | Min. | Typ. | Max. | Unit |
|-----------------------|---|------|------|------|------|
| Nominal frequency     | LVDS output                                   | 8    |      | 1500 | MHz  |
| Output voltage        | Voltage swing (V <sub>od</sub> )              |      | 350  |      | mV   |
| Duty cycle            | Measured @ 1.25 V<br>(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   |

<sup>3</sup> 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                     | MIL-STD-883, method 1011, condition A  | –              | ✓              | ✓              | ✓         |
| Temperature cycling                | MIL-STD-883, method 1010, condition B  | –              | ✓              | ✓              | ✓         |
| Constant acceleration              | MIL-STD-883, method 1010, condition A<br>Acceleration: 5000g, curing 60s 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          | ✓ <sup>4</sup> | ✓ <sup>5</sup> | ✓ <sup>5</sup> | ✓         |
| Burn-in                            | Temperature: +125°C<br>Pressure: Patm<br>Supply Voltage: Vcc nom<br>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   | –              | –              | ✓              | ✓         |

## 8. Ordering Part Example

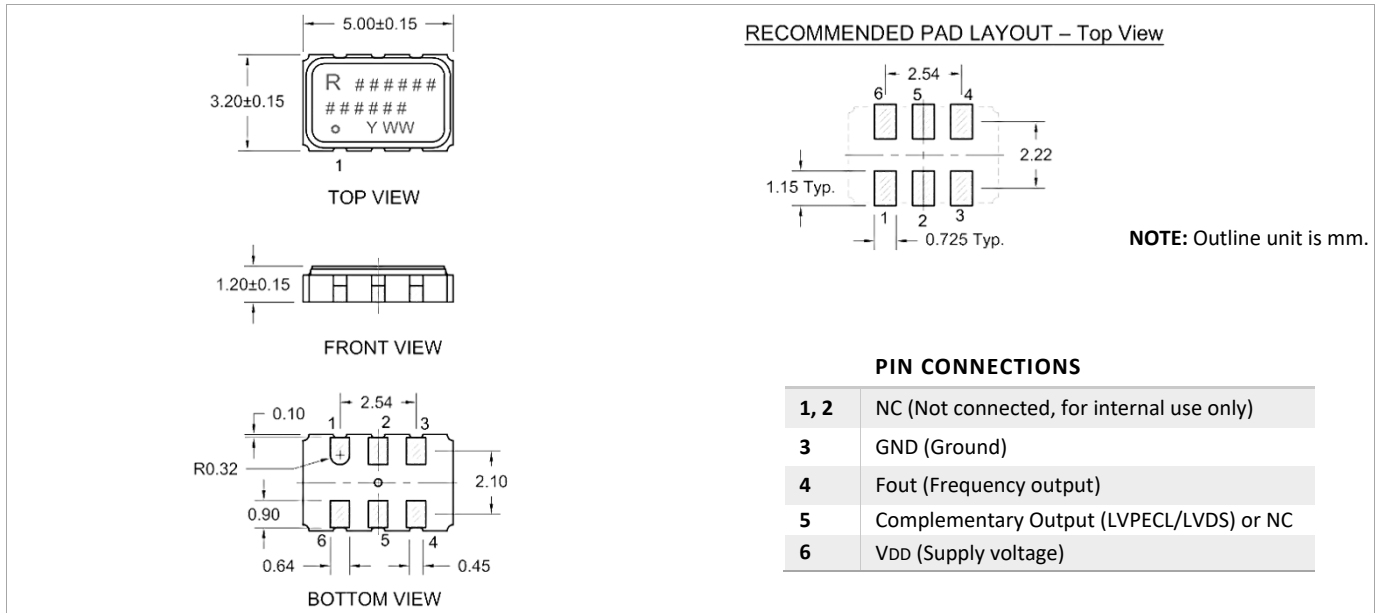


<sup>4</sup> Electrical verification.

<sup>5</sup> 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.

## 9. Model Outline, Pin Connections and Recommended Pad Layout



## 10. Marking

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

## 11. Manufacturing Information

