# ROM7050PA [Preliminary]

## 1.0 Specification References

| Parameter | Description |
|---|---|
| a. Rakon part number | U8177LF |
| b. Description | 20.0MHz ROM7050PA OCXO |
| c. Package | L x W x H: 7.5 x 5.5 x 3.3 mm |


## 2.0 Absolute Maximum Ratings [1]

| Parameter | Min. | Max. | Unit. |
|---|---|---|---|
| a. Storage temperature | -55 | 125 | °C |
| b. Supply voltage (Vcc) | -0.5 | 6 | V |
| c. Power dissipation | | 2 | W |
| d. Load | | 50 | pF |

## 3.0 Frequency Characteristics [2]

| Parameter | Min. | Typ. | Max. | Unit | Test Condition / Description |
|---|---|---|---|---|---|
| a. Nominal frequency (Fn) | | 20.0 | | MHz | |
| b. Frequency calibration, at time of shipment | | | ±0.2 | ppm | At 25°C ± 2°C, after warm-up, reference to Fn |
| c. Reflow shift | | | ±0.5 | ppm | After 1 hour recovery at 25°C |
| d. Operating temperature range | -40 | | +95 | °C | |
| e. Frequency stability over temperature in still air | | | ±20 | ppb | Reference to $(F_{MAX} + F_{MIN})/2$ |
| f. Frequency slope ΔF/ΔT in still air | | | ±0.5 | ppb/°C | Temperature ramp rate ≤ 1°C/minute |
| g. Supply voltage stability | | ±5 | | ppb | ±2% variation, reference to frequency at 3.3V |
| h. Load sensitivity | | ±5 | | ppb | ±10% variation, reference to frequency at 15pF |
| i. Warm-up time (F0-F1) [3] | | 15 | 60 | s | Time after power on needed for frequency F0 to be within ±25ppb reference to frequency F1 after 1 hour |
| j. All causes stability | | | ±4.6 | ppm | Including calibration, temperature, supply voltage & load changes and 10years life, reference to Fn |

## 4.0 Root Allan Variance (at 25°C)

| Parameter | Min. | Typ. | Max. | Unit | Test Condition / Description |
|---|---|---|---|---|---|
| a. Root Allan Variance (RAV) | | $30*10^{-12}$<br>$20*10^{-12}$<br>$15*10^{-12}$<br>$15*10^{-12}$<br>$70*10^{-12}$ | | | tau = 0.1s<br>tau = 1.0s<br>tau = 10s<br>tau = 100s<br>tau = 1000s |

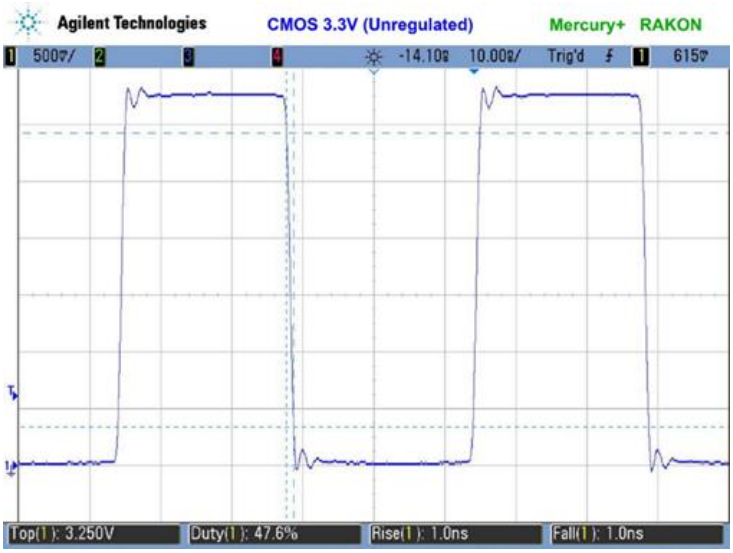
[1] Operating beyond this limit may result in change or permanent damage to the device.
[2] The characteristics of the component may be temporarily affected by the processes of assembly and soldering. The frequency specifications apply after 48 hours of continuous operation after assembly. Nominal conditions (T=25°C, Vcc=3.3V, $C_{load}$=15pF) apply unless otherwise stated.
[3] Parameter is assembly and operating history dependent.

## 5.0 Power Supply

| Parameter | Min. | Typ. | Max. | Unit | Test Condition / Description |
|---|---|---|---|---|---|
| a. Supply voltage (Vcc) | 3.135 | 3.3 | 3.465 | V | ±5% |
| b. Input power (Warm up) | | 1200 | 1500 | mW | At Vcc = 3.3V |
| c. Input power (Steady state in still air at 25°C) | | 440 | 500 | mW | At Vcc = 3.3V |

## 6.0 Output Waveform – CMOS

| Parameter | Min. | Typ. | Max. | Unit | Test Condition / Description |
|---|---|---|---|---|---|
| a. Output voltage level low ($V_{OL}$) | | | 10% Vcc | V | |
| b. Output voltage level high ($V_{OH}$) | 90% Vcc | | | V | |
| c. Rise and fall time | | 1 | 2 | ns | 10% to 90% level |
| d. Duty cycle | 45 | | 55 | % | At 50% level |
| e. Load | | 15 | | pF | Nominal |
| f. Waveform screenshot | | | | | |




## 7.0 SSB Phase Noise & Jitter (at 25°C)

| Parameter | Typ. | Unit. | Test Condition / Description |
|---|---|---|---|
| a. 1Hz offset | -73 | dBc/Hz | |
| b. 10Hz offset | -105 | dBc/Hz | |
| c. 100Hz offset | -134 | dBc/Hz | |
| d. 1kHz offset | -154 | dBc/Hz | |
| e. 10kHz offset | -158 | dBc/Hz | |
| f. 100kHz offset | -158 | dBc/Hz | |
| g. 1MHz offset | -158 | dBc/Hz | |
| h. Jitter, RMS | 0.3 | ps | 12kHz to 5MHz |

## 8.0 Marking

| Parameter | Description |
|---|---|
| a. Line 1 (Embossed) | rakon |
| b. Line 2 (Laser marked) | [R FFFF YM ]<br>Rakon identifier R, Frequency FFFF (M=MHz, e.g. 20M0=20.0MHz),<br>Year Y (A=2010, B=2011, …), Month M (1=Jan, 2=Feb, …, A=Oct, B=Nov, C=Dec) |
| c. Line 3<br>(Embossed and Laser marked) | [ • LLL ]<br>Pin 1 • (embossed), Lot code LLL (laser marked) |

## 9.0 Manufacturing Information

| Parameter | Description |
|---|---|
| a. Reflow soldering | IPC/JEDEC J-STD-020E, see Pb-free solder reflow profile attached |
| b. Packaging description | Tape & Reel as per EIA-481-E (see drawing) |
| c. Application note | For optimum performance follow the instructions in Guidelines for use of Mercury™ /Mercury+™ IC-OCXO |

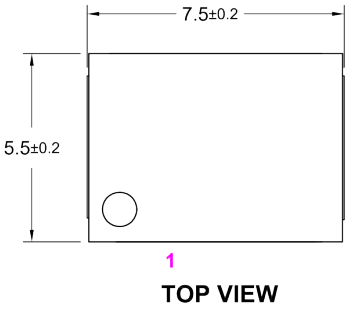
## 10.0 Environmental Specifications [4]

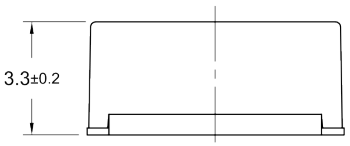
| Parameter | Description |
|---|---|
| a. RoHS | Parts are fully compliant with the European Union directives 2011/65/EU and 2015/863/EU (amending annex II to directive 2011/65/EU) on the restriction of the use of certain hazardous substances in electrical and electronic equipment. |
| b. Solderability | IPC/ECA J-STD-002, method 2, precondition 150°C, 16 hours |
| c. Latch Up | EIA/JESD78, tested at room temperature and maximum ambient operating temperature |
| d. Electrostatic Discharge (ESD) | Human Body Model (HBM), JEDEC JS-001, ≥ 2000V<br>Charged Device Model (CDM), JESD22-C101, ≥ 1000V<br>Machine Model (MM), JESD22-A115, ≥ 200V |
| e. Low Temperature Storage | JESD22-A119, 1000 hours at -55°C, unbiased |
| f. Thermal Shock | JESD22-A104 / MIL-STD-883, method 1010, 15 cycles from -55°C to 125°C |
| g. Temperature Humidity Bias | EIA/JESD22-A101-B, 85°C / 85% RH, 1008 hours, at max. Vcc |
| h. Temperature Cycling | JESD22-A104 / MIL-STD-883, method 1010, 1000 cycles, -55°C to +125°C, non-operating, 15 minute soak |
| i. High Temperature Operating Life | JESD22-A108, ≥ 2000 hours at 125°C & max. Vcc |
| j. Cold Power Cycling | Rakon standard, -40°C, 12 minutes OFF, 4 minutes ON, 1000 cycles |
| k. Frequency Aging | MIL-PRF-55310, 1008 hours |
| l. Mechanical Shock | MIL-STD-202 (method 213), 1500*g*, 0.5ms duration, 18 shocks total |
| m. Vibration | JESD22-B103 (section 4.2.2), test Fc: 20*g*, 20 to 2000Hz, 4 minute sweep, 4 sweeps x 3 axes |

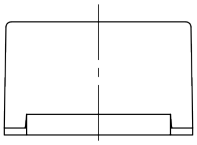
[4] For all relevant tests the units are pre-conditioned as per JESD22-A113 (5 temperature cycles -40°C to +60°C + bake for 24 hours at T = +125°C + moisture soak for 168 hours at +85°C / 85% RH + 3x reflow at $T_{MAX}$ = +260°C)

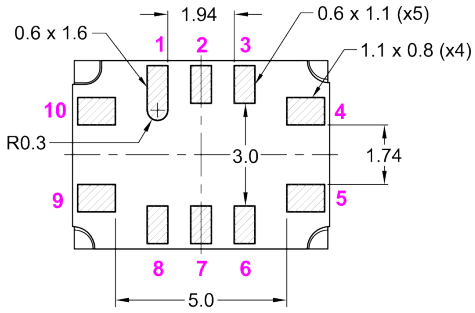
## 11.0 Model Outline and Test Circuit

### MODEL DRAWING

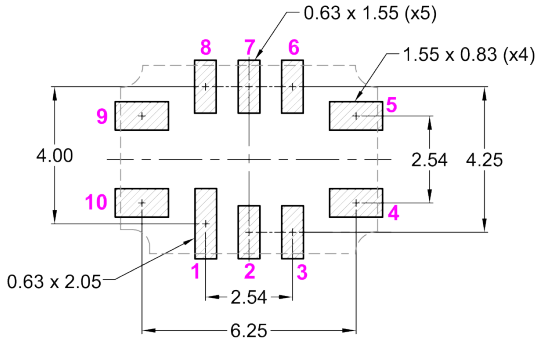



### RECOMMENDED PAD LAYOUT - TOP VIEW

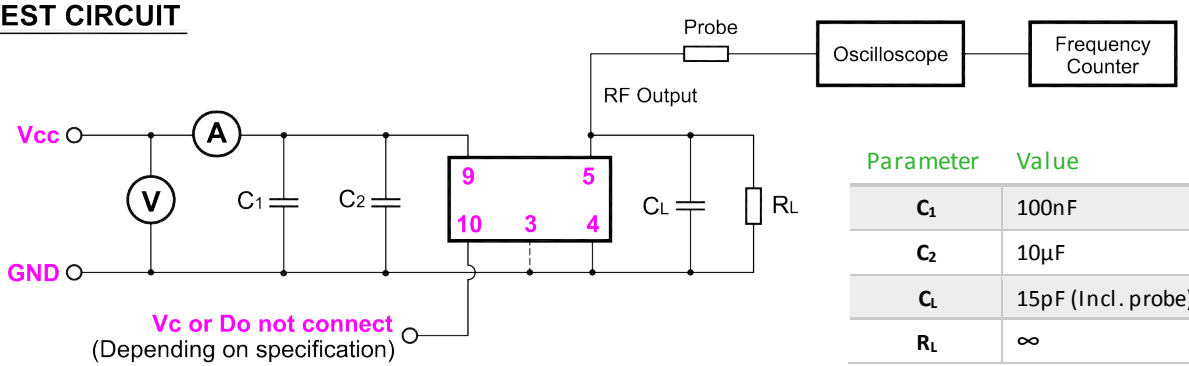



**NOTE:**

- The area between the pads is a keep-out area, no tracks or ground plane allowed on any layer.

| Pin | Connections |
|---|---|
| 1 | NC |
| 2 | NC |
| 3 | Do not connect (GND optional) |
| 4 | GND |
| 5 | RF Output |
| 6 | NC |
| 7 | NC |
| 8 | NC |
| 9 | Supply Voltage (Vcc) |
| 10 | Do not connect (GND optional) |

### TEST CIRCUIT

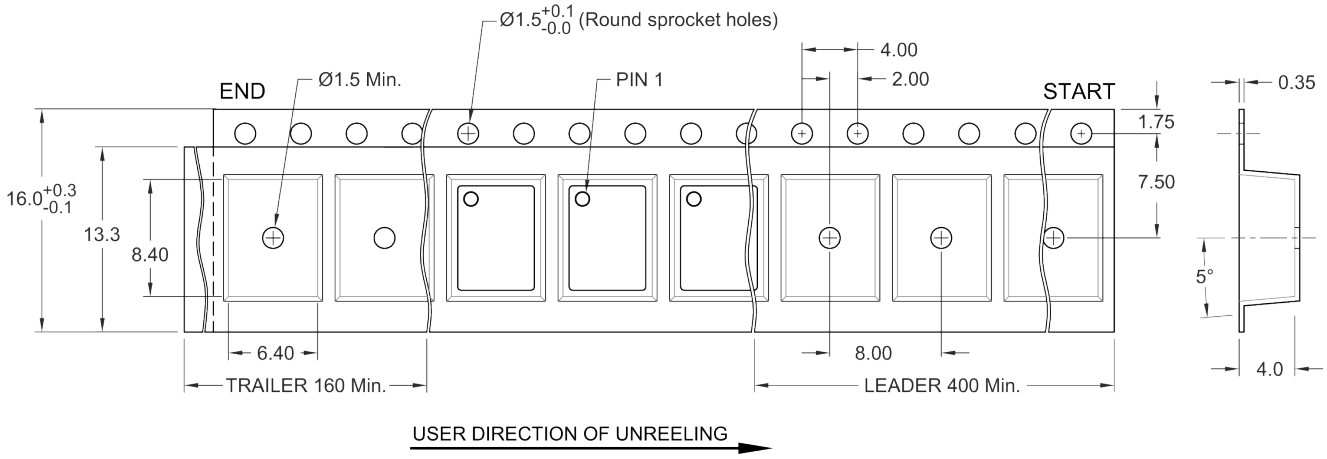



| Parameter | Value |
|---|---|
| $C_1$ | 100nF |
| $C_2$ | 10µF |
| $C_L$ | 15pF (Incl. probe) |
| $R_L$ | ∞ |

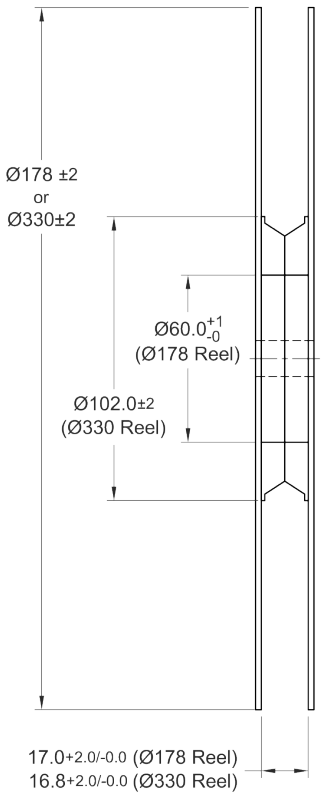
| | | |
|---|---|---|
| TITLE: IC OCXO 7x5 MODEL | FILENAME: CAT1533 | TOLERANCES: |
| RELATED DRAWINGS: | REVISION: A | XX = |
| | DATE: 25-Sep-2019 | X.X = ±0.2 |
| | SCALE: 5 : 1 | X.XX = ±0.10 |
| | Millimetres | X.XXX = |
| | | X° = |
| | | Hole = |

## 12.0 Tape and Reel:

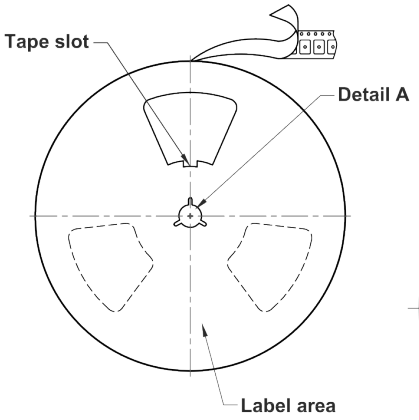
### TAPE DETAILS



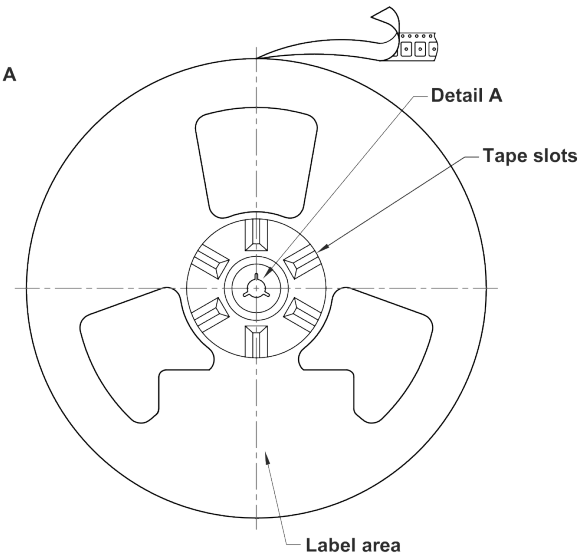

### REEL DETAILS



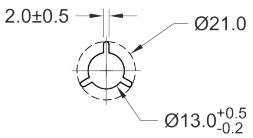

**Ø178 REEL**




**Ø330 REEL**



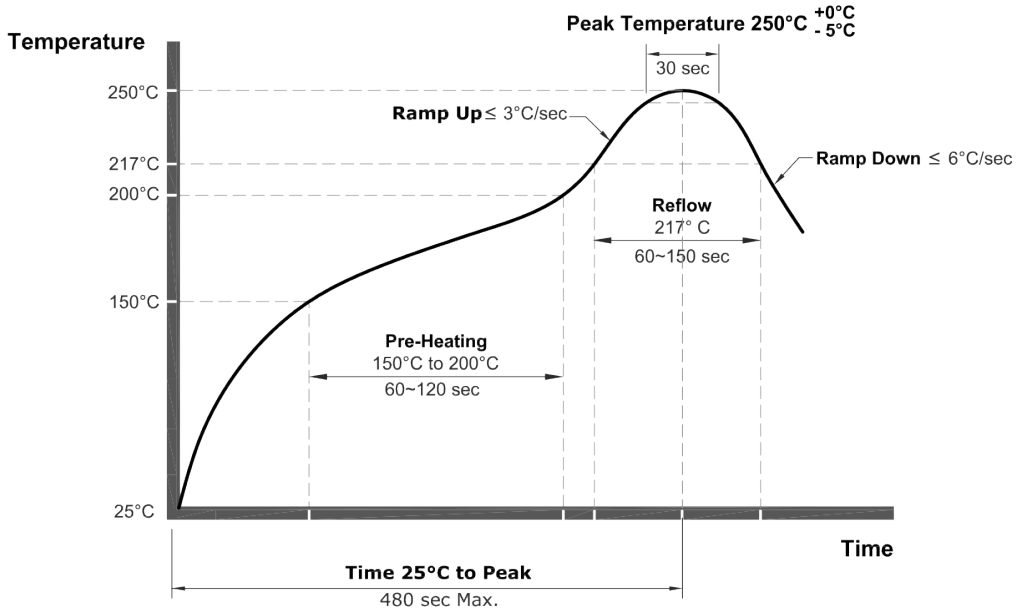

**DETAIL A**




**Note:** The tape & reel packaging specifications follow the guidelines of the EIA Standard EIA-481-E.

| | | |
|---|---|---|
| TITLE: 7050 Series Oscillators Tape & Reel | FILENAME: CAT1534 | TOLERANCES: |
| RELATED DRAWINGS: | REVISION: A | XX = |
| | DATE: 05-Sep-2019 | X.X = ±0.2 |
| | SCALE: | X.XX = ±0.10 |
| | Millimetres | X.XXX = |
| | | X° = |
| | | Hole = |

## 13.0 Reflow:




## Note:

- The Pb-free Reflow follows the guidelines of IPC/JEDC J-STD-020E.
- The product has been tested to withstand the Reflow Profile shown. The Reflow Profile used to solder Rakon products is determined by the solder paste Manufacturer's specification. It is recommended that the Reflow Profile used does not exceed the one shown above.

| | |
|---|---|
| TITLE: Pb-Free Oscillator Reflow (Classification Temperature Tc = 250°C) | FILENAME: CAT649 |
| RELATED DRAWINGS: | REVISION: B |
| | DATE: 15-May-2019 |
| | SCALE: NTS |
| | Millimetres |

## 14.0 Specification History

| Revision | User | Changes | Approver(s) | Date |
|---|---|---|---|---|
| A | JO | Initial issue | AA | 2020-04-02 |

## 15.0 Disclaimer

| Parameter | Description |
|---|---|
| a. Disclaimer | "Samples supplied according to this specification are supplied from our development or pre-production programme and as such are not qualification approved products. No condition, warranty or representation regarding quality, suitability, performance, life or continuation of supply is given or implied and Guarantee in clause 6.1 of our standard Conditions of Sale is not applicable. The right is reserved to change the design or specification or cease supply without notice." RAKON Limited |