

E8006LF

1.0 Specification References

Parameter	Description
a. Rakon part number	E8006LF
b. Description	10.0MHz RNT7050AL TCXO
c. Version	B (2020-01-07)
d. Package	L x W x H: 7.0 x 5.0 x 2.0 mm



2.0 Absolute Maximum Rating ¹

Parameter	Min.	Max.	Unit
a. Power supply	-0.6	4.6	V
b. Storage temperature	-55	125	°C

3.0 Frequency Characteristics

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Nominal frequency		10.0		MHz	
b. Frequency calibration			± 0.5	ppm	Offset from nominal frequency measured at 25°C $\pm 2^\circ\text{C}$
c. Reflow shift			± 0.5	ppm	Two consecutive reflows as per attached profile after 2 hours relaxation at 25°C
d. Temperature range	-40		+85	°C	The operating temperature range over which the frequency stability is measured
e. Frequency stability over temperature ^{2 3}			± 50	ppb	
f. Frequency slope			± 20	ppb/°C	Minimum of one frequency reading every 2°C over the operating temperature range ^{2 3}
g. Hysteresis		± 20		ppb	Over a $\pm 20^\circ\text{C}$ window
h. Hysteresis		± 50		ppb	Operating temperature range
i. Sensitivity to supply voltage variations			± 0.1	ppm	Supply voltage varied $\pm 5\%$ at 25°C
j. Sensitivity to load variations			± 0.2	ppm	$\pm 10\%$ load change at 25°C ⁴
k. All causes stability			± 4.6	ppm	Including calibration, reflow, temperature, supply & load changes and 10 years aging

¹ Operating beyond this limit may result in change or permanent damage to the device.

² Referenced to the midpoint between minimum and maximum frequency value over the specified temperature range. Temperature varied at maximum of 1°C per minute.

³ Parts should be shielded from drafts causing unexpected thermal gradients. Temperature changes due to ambient air currents on the oscillator can lead to short term frequency drift.

⁴ Measurement load condition is 10k Ω /10pF for CS and 15pF for CMOS.

4.0 Power Supply

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Supply voltage (V_{DD})	3.135	3.3	3.465	V	
b. Current		4	5	mA	At $V_{DD} = 3.3V$ and 15pF load

5.0 Oscillator Output – CMOS Option

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Output voltage level low (V_{OL})			10	% V_{DD}	Measured with a capacitive load of 15pF
b. Output voltage level high (V_{OH})	90			% V_{DD}	Measured with a capacitive load of 15pF
c. Rise and fall times time		4.5	6.5	ns	Measured with a capacitive load of 15pF
a. Duty cycle	40	50	60		Measured at 50% V_{DD} trigger level
b. Output load		15		pF	

6.0 Tri-State Control ⁵

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Tri-state mode					The device features a tri-state mode which allows the output to be disabled and brought into a high impedance state
b. Tri-state control (pin 8), input level low (V_{IL})			20% V_{DD}	V	Device disabled (output in high impedance state)
c. Tri-state control (pin 8), input level high (V_{IH})	80% V_{DD}			V	Device enabled (operating)
d. Current when in tri-state mode			3.2	mA	

⁵ The tri-state control (enable) input pin has an internal 100k Ω pull up resistor which allows it to be left unconnected if not used. When in tri-state mode, the output stage is disabled, but the oscillator and compensation circuit are still active.

7.0 SSB Phase Noise (at 25°C)

Parameter	Typ.	Unit.	Test Condition / Description
a. 1Hz offset	-72	dBc/Hz	
b. 10Hz offset	-103	dBc/Hz	
c. 100Hz offset	-125	dBc/Hz	
d. 1kHz offset	-145	dBc/Hz	
e. 10kHz offset	-156	dBc/Hz	
f. 100kHz offset	-157	dBc/Hz	
g. 1MHz offset	-158	dBc/Hz	
h. 5MHz offset	-158	dBc/Hz	
i. RMS phase jitter	0.5	ps	10Hz to 100kHz

8.0 Marking

Parameter	Test Condition / Description
a. Type	Engraved
b. Line 1	[R FFFF YM] Rakon identifier R, Frequency FFFF (M=MHz, e.g. 10M0=10.0MHz), Year Y (A=2010, B=2011, ...), Month M (1=Jan, 2=Feb, ..., A=Oct, B=Nov, C=Dec)
c. Line 2	[• LLL] Pin 1 •, Lot code LLL

9.0 Manufacturing Information

Parameter	Test Condition / Description
a. Reflow	Solder reflow processes as per attached profile
b. Packaging description	Tape and reel (see drawing)

10.0 Environmental Specification ⁶

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. Electrostatic discharge (ESD)	Human body model (HBM), AECQ100-002, $\geq 2000V$ Machine model (MM), AECQ100-003, $\geq 200V$
c. High temperature storage	JESD22-A103, 1000 hours at $+125^{\circ}C$
d. Temperature cycling	JESD22-A104, 1000 cycles, $-55^{\circ}C$ to $+125^{\circ}C$
e. Temperature humidity bias	JESD22-A101-B, $85^{\circ}C$ / 85% RH, 1008 hours, at max. Vcc
f. Mechanical shock	JESD22-B104 (service condition B), 1500g, 0.5ms, 5 pulses in each of 6 directions
g. Vibration	JESD22-B103 (section 4.2.2)/MIL-STD-202, M204, 20g, 20 to 2000Hz, 12 hours total

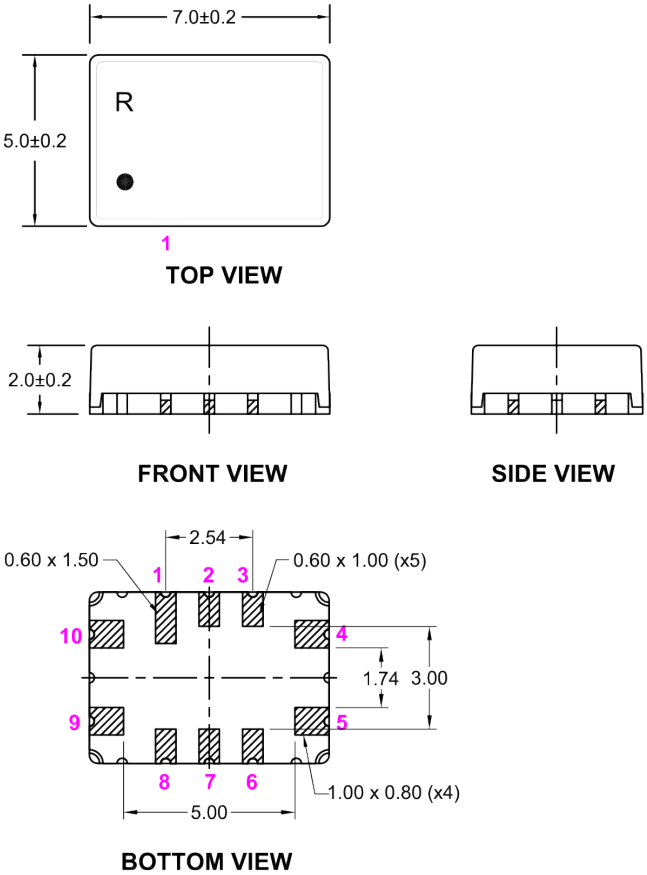
11.0 Disclaimer

Parameter	Test Condition / 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

⁶ For relevant tests the units are pre-conditioned as per JESD22-A113 (5 temperature cycles $-40^{\circ}C$ to $+60^{\circ}C$ + bake for 24 hours at $T = +125^{\circ}C$ + moisture soak for 168 hours at $+85^{\circ}C$ / 85% RH + 3x reflow at $T_{MAX} = +260^{\circ}C$).

12.0 Model Outline:

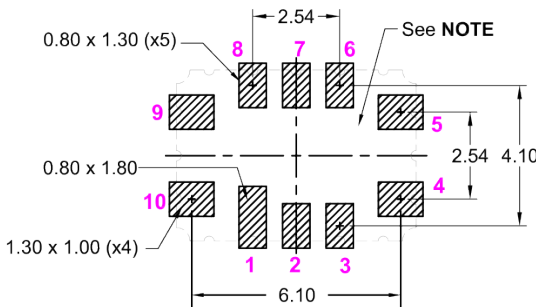
MODEL DRAWING



Pin Connections

Pin	Connections
1	NC
2	Do not connect
3	NC
4	GND
5	RF Output
6	NC
7	NC
8	Output Enable
9	Supply Voltage (VDD)
10	Do not connect

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.

TITLE: Neptune™ RNT7050 TCXO Model (With Cover)

FILENAME: CAT1095

TOLERANCES:

RELATED DRAWINGS:

REVISION: B

XX =

DATE: 07-Dec-2017

X.X = ± 0.2

SCALE: 5 : 1

X.XX = ± 0.10

Millimetres

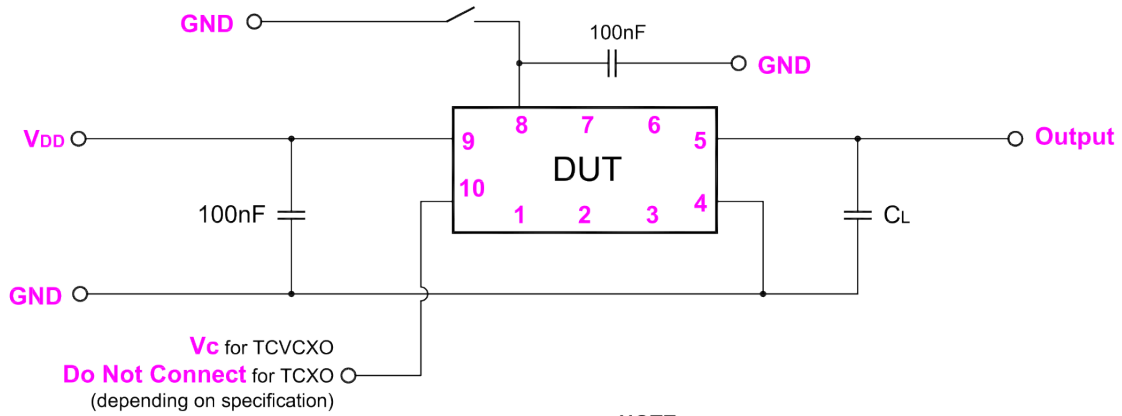
X.XXX =

X° =

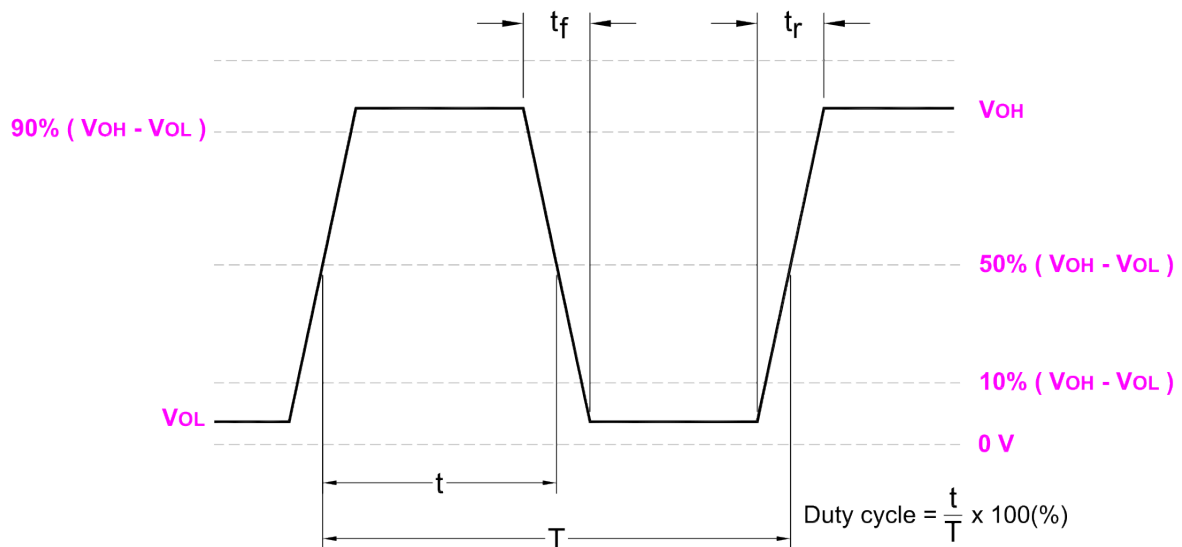
Hole =

13.0 Test Circuit:

HCMOS:



OUTPUT WAVEFORM – HCMOS:



TITLE: Neptune™ RNT7050 TEST CIRCUIT & OUTPUT WAVEFORM

FILENAME: CAT1083

TOLERANCES:

RELATED DRAWINGS:

REVISION: B

XX =

DATE: 22-Feb-2018

X.X =

SCALE: NTS

X.XX =

Millimetres

X.XXX =

X° =

Hole =

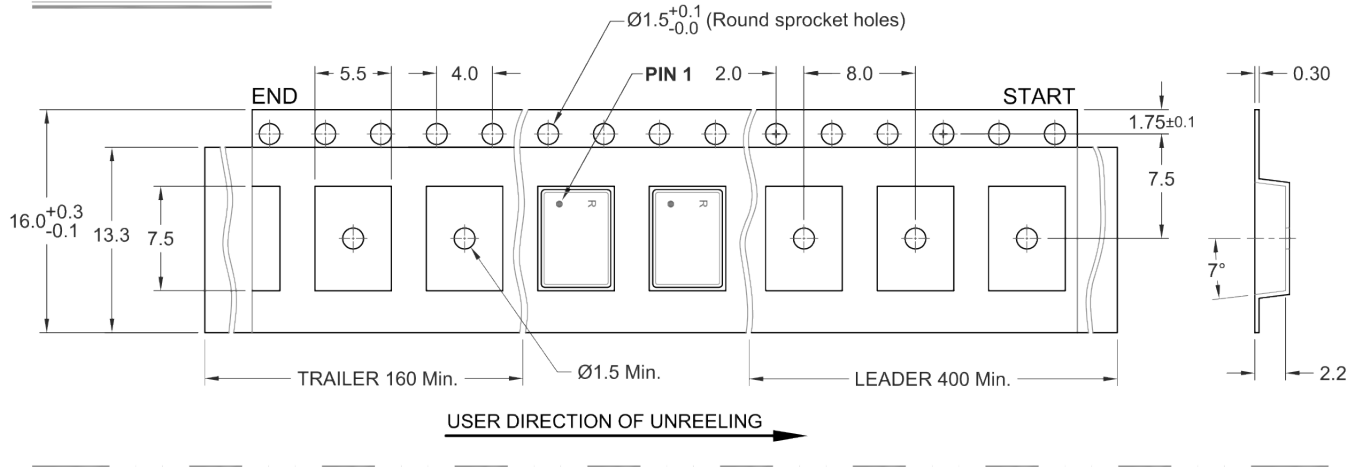
PRELIMINARY

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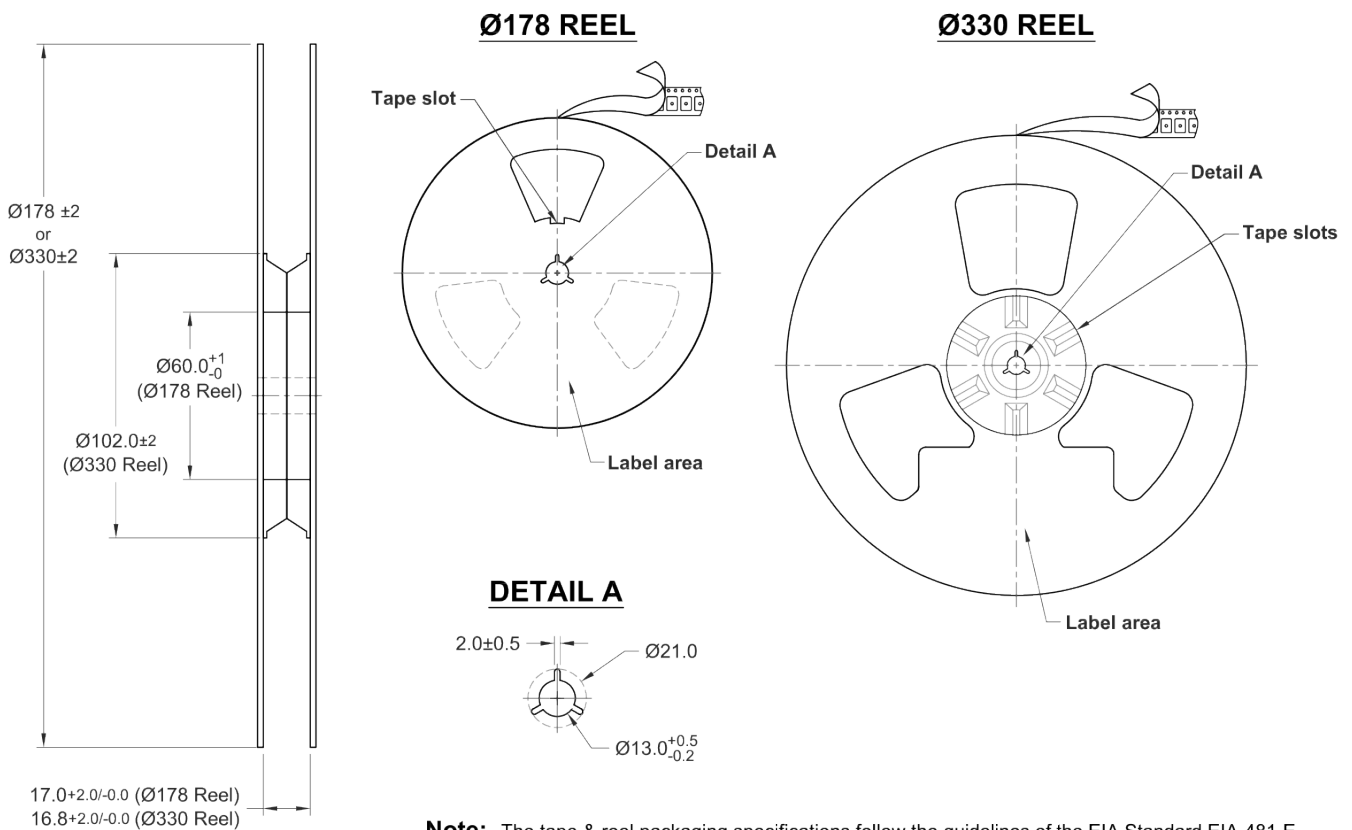
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14.0 Tape and Reel ($\varnothing 178$ mm or $\varnothing 330$ mm):

TAPE DETAILS



REEL DETAILS



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

TITLE: RNT7050AL SERIES TAPE & REEL

RELATED DRAWINGS:

FILENAME: CAT1096

REVISION: B

DATE: 14-Nov-2019

SCALE:

Millimetres

TOLERANCES:

XX = ± 1

X.X = ± 0.2

X.XX = ± 0.10

X.XXX =

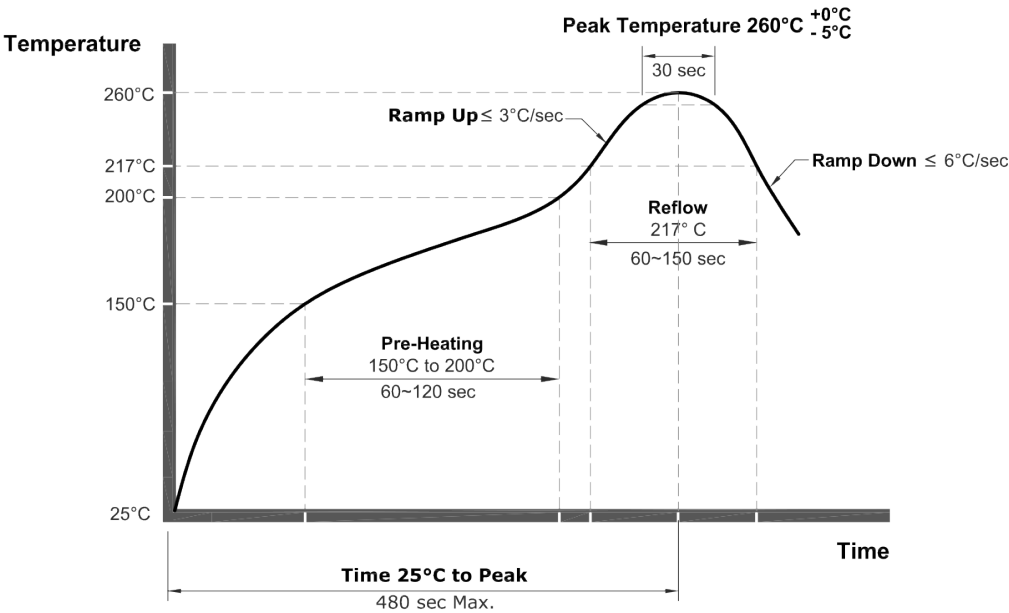
X° =

Hole =

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15.0 Reflow:



Note:

- The Pb-free Reflow follows the guidelines of IPC/JEDC J-STD-020E.
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- 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 $T_c = 260^{\circ}\text{C}$)

FILENAME: CAT541

RELATED DRAWINGS:

REVISION: C

DATE: 15-May-2019

SCALE: NTS

Millimetres

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16.0 Specification History

Version	User	Changes	Approver	Date
A	PK	Initial issue	JM/BC	2019-07-24
B	JO	Updated model name, model image, environmental section, outline, tape & reel and reflow profile drawings	ECO-02820	2020-01-07