

E6777LF

1.0 Specification References

Parameter	Description
a. Rakon part number	E6777LF
b. Description	10.0MHz RPT5032A TCVCXO
c. Version	2 (2023-02-14)
d. Package	L x W x H: 5.0 x 3.2 x 1.85 mm nom. (6 pad)



2.0 Absolute Maximum Ratings¹

Parameter	Min.	Max.	Unit.
a. Junction temperature		150	°C
b. Supply voltage (Vcc)	-0.5	7	V
c. All other inputs	-0.5	Vcc + 0.5	V
d. Power dissipation		100	mW

3.0 Frequency Characteristics

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Nominal frequency		10.0		MHz	
b. Frequency calibration			±1	ppm	Initial accuracy at 25°C ±1°C, Vc=1.5V
c. Reflow shift			±0.5	ppm	Pre to post reflow ΔF (measured ≥ 60 minutes after reflow)
d. Operating temperature range	-40		+85	°C	
e. Frequency stability over temperature			±2	ppm	Reference to (F _{MAX} + F _{MIN})/2
f. Slope over temperature			±200	ppb/°C	ΔF/ΔT
g. Supply voltage stability		±25		ppb	±5% variation, reference to frequency at nominal supply voltage
h. Load sensitivity		±50		ppb	±5pF variation, reference to frequency at nominal load
i. Long term stability			±1 ±3	ppm ppm	1 year 10 years
j. Acceleration stability		< 2		ppb/g	Gamma vector, 3-axes, 30-1500Hz
k. Start-up time			15	ms	90% amplitude

4.0 Power Supply

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Supply voltage (Vcc)		3.3		V	±5%
b. Supply current		3	4	mA	

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

5.0 Control Voltage (Vc)

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Control voltage range	0.5		2.5	V	
b. Frequency tuning	±5			ppm	
c. Slope		+7.5		ppm/V	
d. Linearity			1	%	
e. Port input impedance	100			kΩ	
f. Modulation bandwidth	1			Hz	

6.0 Oscillator Output – HCMOS

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Output waveform					HCMOS (LVCMOS & LVTTTL compatible as per JESD8C)
b. Output voltage level low (V _{OL})			10% V _{CC}	V	
c. Output voltage level high (V _{OH})	90% V _{CC}			V	
d. Rise and fall time			8	ns	10% to 90% level
e. Duty cycle	45		55	%	At 50% level
f. Load		15		pF	

7.0 Tri-State Control²

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 6), input level low (V _{IL})			20% V _{CC}	V	Device disabled (output in high impedance state)
c. Tri-state control (pin 6), input level high (V _{IH})	60% V _{CC}			V	Device enabled (operating)
d. Current when in tri-state mode		2		mA	
e. Output enable time			100	μs	

8.0 Pin Connections

Parameter	Connections
a. Pin 1	Control Voltage (Vc)
b. Pin 2	GND
c. Pin 3	Do not connect
d. Pin 4	RF Output
e. Pin 5	Supply Voltage (V _{CC})
f. Pin 6	Tri-state Control (Enable) ²

² The tristate control (enable) input pin has an internal 100kΩ pull up resistor which allows it to be left unconnected if not used. When in tristate mode, the output stage is disabled, but the oscillator and compensation circuit are still active.

9.0 SSB Phase Noise and RMS Jitter (at 25°C)

Parameter	Typ.	Unit.	Test Condition / Description
a. 1Hz offset	-75	dBc/Hz	
b. 10Hz offset	-100	dBc/Hz	
c. 100Hz offset	-130	dBc/Hz	
d. 1kHz offset	-141	dBc/Hz	
e. 10kHz offset	-148	dBc/Hz	
f. 100kHz offset	-150	dBc/Hz	
g. 1MHz offset	-155	dBc/Hz	
h. RMS Jitter	1	ps	12kHz ~ 5MHz

10.0 Root Allan Variance (at 25°C)

Parameter	Min.	Typ.	Max.	Unit	Test Condition / Description
a. Root Allan Variance		$2 \cdot 10^{-10}$			tau = 1.0s

11.0 Marking

Parameter	Description
a. Type	Laser marked
b. Line 1	[R X XX] R = Rakon, X XX = manufacturing identifier
c. Line 2	[Δ nnnn YW] Δ = pin 1 mark, nnnn = abbreviated part number, YW = device date code

12.0 Manufacturing Information

Parameter	Description
a. Reflow soldering	Reflow profile as per IPC/JEDEC J-STD-020E (see drawing)
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 Pluto/Pluto+™ Ultra-Stable TCXOs

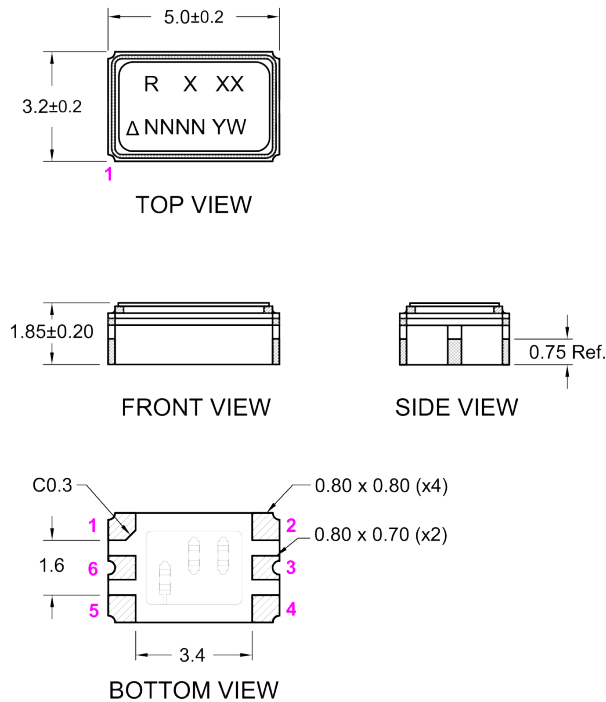
13.0 Environmental Specification³

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. Temperature humidity bias	JESD22-A101D, +85°C/85%RH, at max. Vcc, 1000 hours
c. Pressure cooker test	JESD22A-102E, 121°C/100%RH/29.7PSIG, 96 hours
d. Temperature cycling	JESD22-A104F, -55°C to +125°C, 1000 cycles, 10 minute soak
e. High temperature storage	JESD22-A103E, +150°C, 1000 hours, unbiased
f. Low temperature storage	MIL-STD-883K, -55°C, 1000 hours, unbiased
g. High temperature operating life	JESD22-A108D, +125°C, 1008 hours, at max. Vcc
h. Mechanical shock	JESD22-B110B, 1500g peak, 0.5ms pulse duration, 5 pulses in each of 6 directions
i. Vibration	JESD22-B-103B, 20g peak acceleration, 10-2000Hz, 3 axis, 4 cycles per axis, 4 minutes per cycle
j. Solderability	J-STD-002D, condition E, precondition 4 hours dry bake at +155°C
k. Moisture resistance	JESD22-A113I, MSL = 1
l. Resistance to soldering heat	MIL-STD-202H M210, convection reflow, Tmax = +260°C, 3 reflow cycles
m. Long-term stability (frequency aging)	MIL-PRF-55310F / MIL-STD-883K Method 2019, 1000 hours at +85°C

³ For relevant tests, parts have been preconditioned as per JESD22-A113I (bake for 24 hours at T = +125°C + moisture soak for 168 hours at +85°C/85%RH + 3x reflow at Tmax = +260°C)

14.0 Model Outline:

MODEL DRAWING



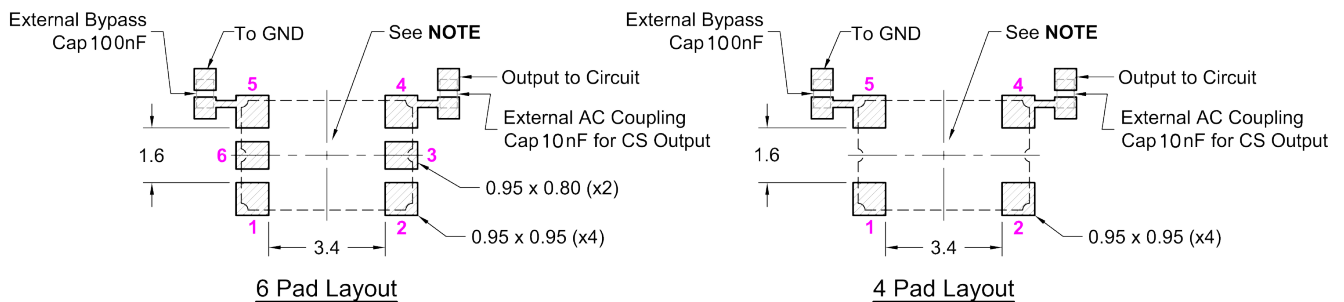
Pin Connections

Pin	Connections
1	Control Voltage (Vc)
2	GND
3	Do not connect
4	RF Output
5	Supply Voltage (Vcc)
6	Tri-state Control (Enable)

NOTE:

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

RECOMMENDED PAD LAYOUT - TOP VIEW



TITLE: RPT5032 MODEL (6 Pad)

RELATED DRAWINGS:

FILENAME: CAT1577

REVISION: A

DATE: 10-Nov-2021

SCALE: 5 : 1

Millimetres

TOLERANCES:

XX =

X.X = ±0.2

X.XX = ±0.10

X.XXX =

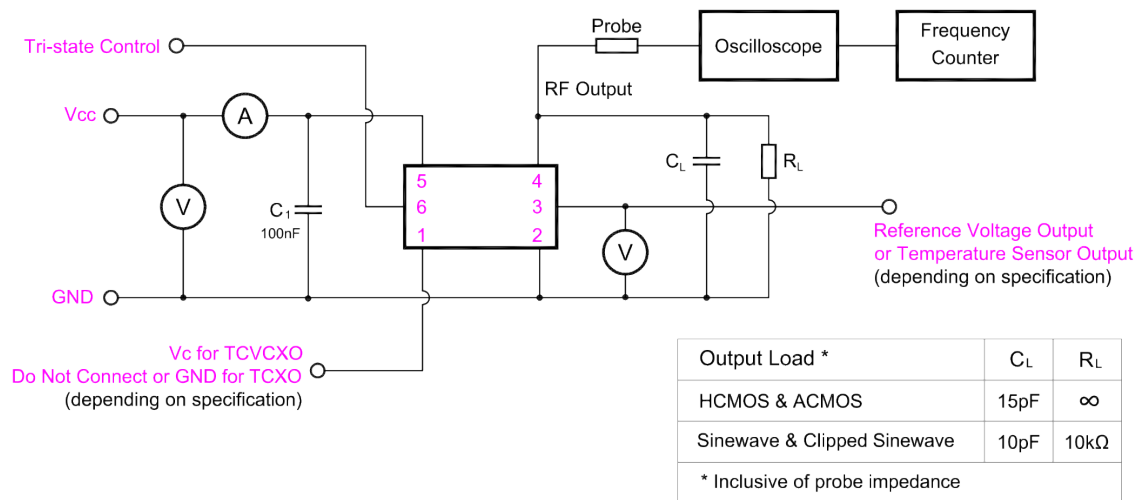
X° =

Hole =

rakon

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15.0 Test Circuit and Output Waveform:



TITLE: Pluto+ TCXO/TCVCXO TEST CIRCUIT

FILENAME: CAT781

RELATED DRAWINGS:

REVISION: A

DATE: 20-Mar-13

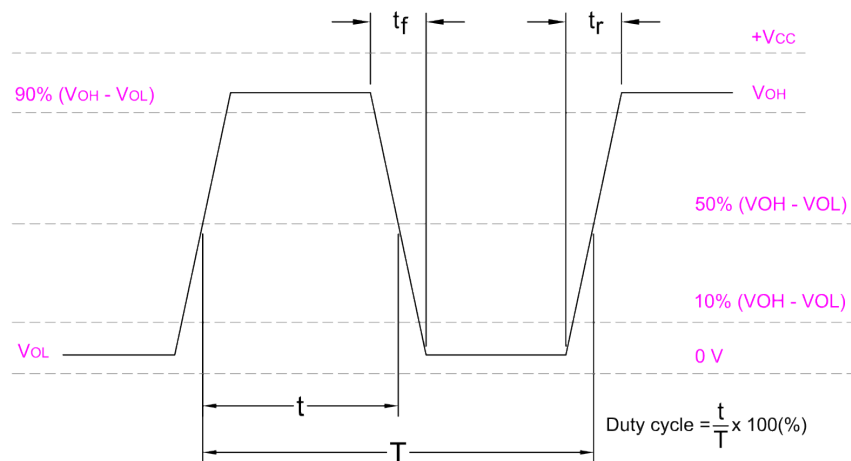
SCALE: NTS

Millimetres

rakon

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OUTPUT WAVEFORM - HCMOS & ACMOS:



TITLE: Pluto+ TCXO/TCVCXO OUTPUT WAVEFORM

FILENAME: CAT784

RELATED DRAWINGS:

REVISION: A

DATE: 15-Mar-13

SCALE: NTS

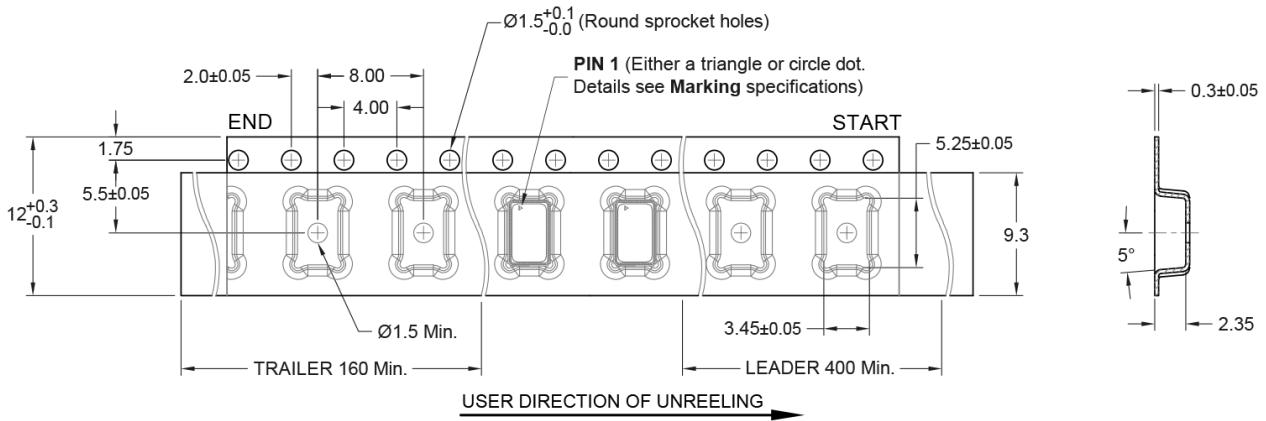
Millimetres

rakon

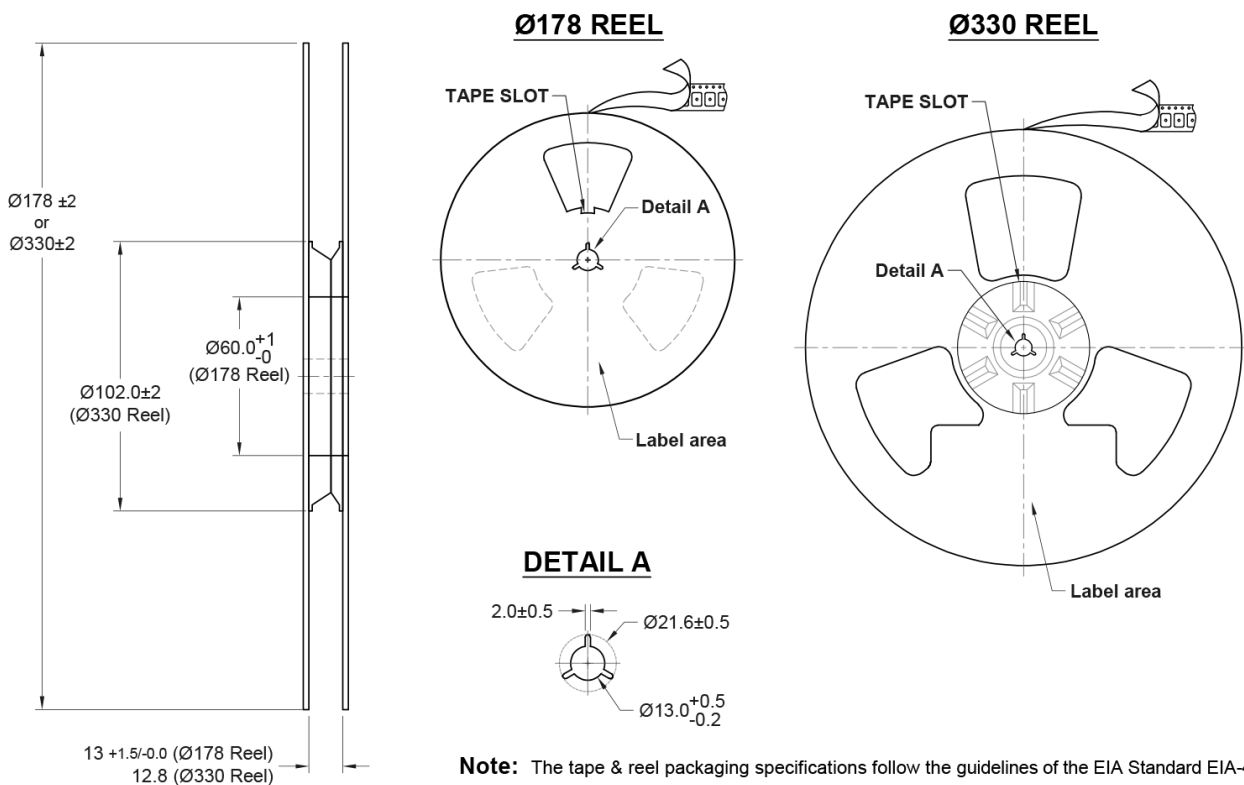
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16.0 Tape and Reel (Ø178mm / Ø330mm):

TAPE DETAILS



REEL DETAILS



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

TITLE: 5032 SERIES TAPE & REEL (Type 2)

FILENAME: CAT1604

TOLERANCES:

RELATED DRAWINGS:

REVISION: A

$$\begin{aligned} \lambda\lambda &= \pm 1 \\ X.X &= \pm 0.2 \end{aligned}$$

DATE: 10-Feb-2023

X.XX = ± 0.1

SCALE:

$$\begin{array}{rcl} X.XXX & = & \\ Y^{\circ} & = & \end{array}$$

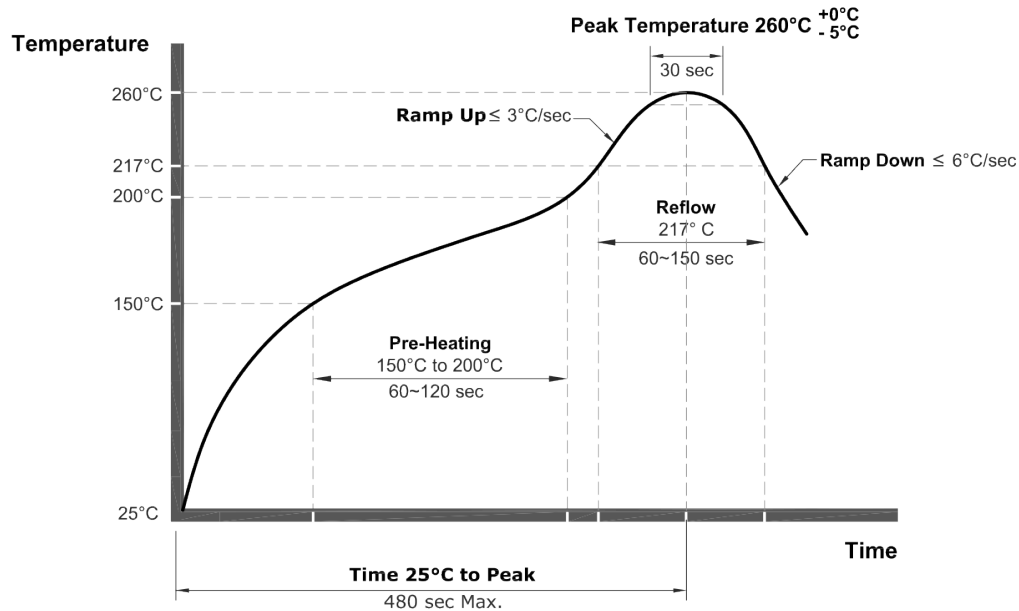
Millimetres

Hole =

rakon

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17.0 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 $T_c = 260^{\circ}\text{C}$)

FILENAME: CAT541

RELATED DRAWINGS:

REVISION: C

DATE: 15-May-2019

SCALE: NTS

Millimetres

rakon

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18.0 Specification History

Version	User	Changes	Approver	Date
A.	JO	Datasheet created	BP	2015-01-06
B.	JO	SAP number added	BP	2015-02-03
1	JO	Part released to production	HP	2015-06-04
2	JO	Specification updated as a result of the conversion to GGI process (includes updated outline, tape & reel and reflow profile drawings + updated environmental specification).	ECO-09061	2023-02-14