

Frequency Components and Antennas for Wearables Applications



Nov. 2023

The logo for RALTROn is displayed in a bold, black, sans-serif font. The letter 'O' is replaced by a solid blue circle. The logo is set against a white background with a thin black border.

RALTROn

Introduction



Raltron offers the most comprehensive line of frequency management components for Wearables Applications, from simple tuning fork crystals to high stability temperature compensated crystal oscillators and antennas. These products are designed to satisfy the ultra-low power, small footprint, and low-cost requirements of this growing market.

What is Wearables Applications?



Smart Watches



Smart Glasses



Smart Rings



Virtual Reality Glasses



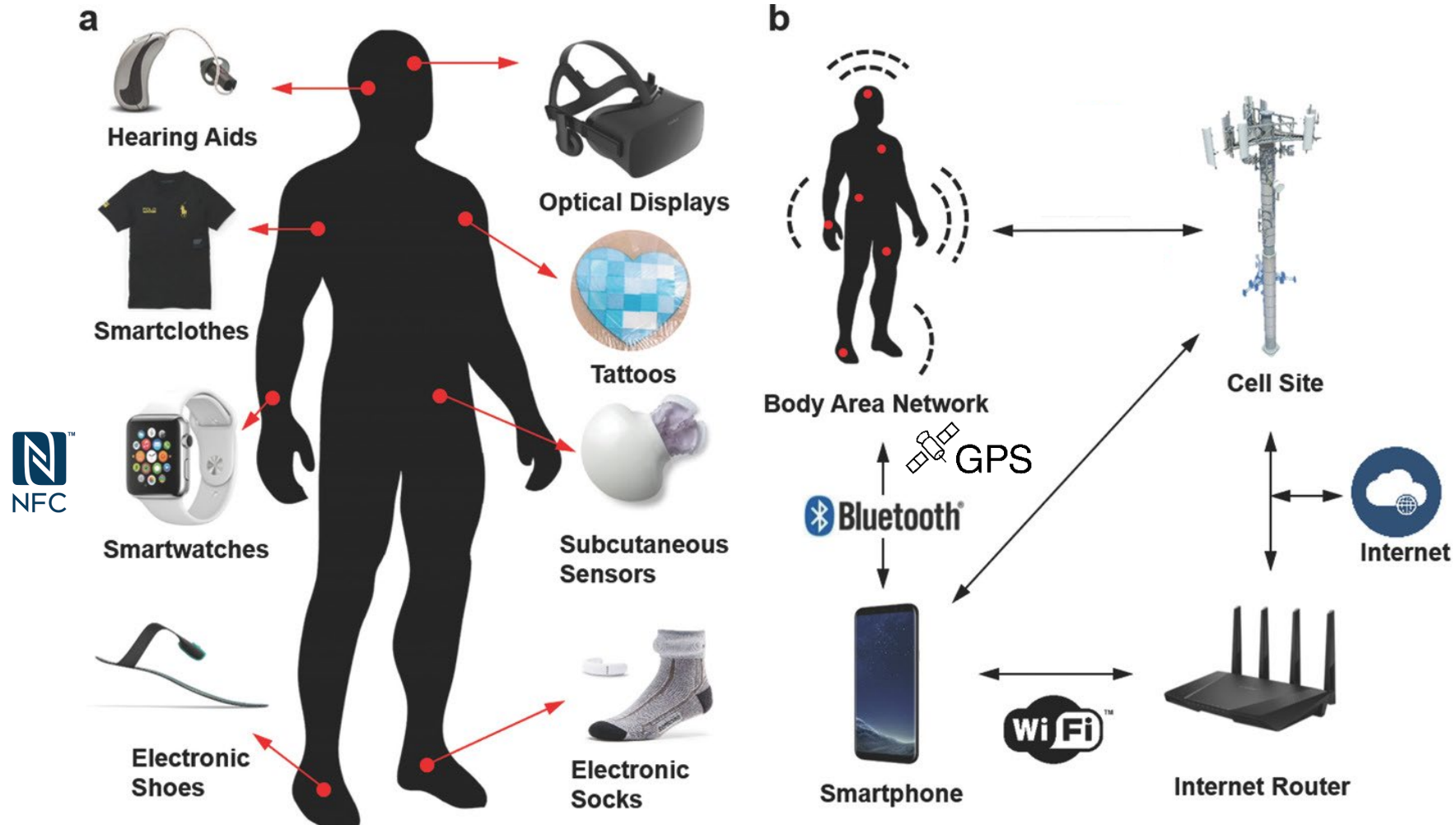
Smart Shoes



Smart Nicotine Patch

- Wearable technology is any technology that is designed to be used while worn. Common types of wearable technology include smartwatches and smart glasses.
- Wearable devices are close to the body and can detect, analyze, and send data about the body and the environment. They can also provide feedback to the wearer.

Wearables in Medicine Example



Source: https://onlinelibrary.wiley.com/doi/full/10.1002/adma.201706910?utm_campaign=mention57529&utm_medium=inline&utm_content=lnk241316896300&utm_source=xakep

Solutions for Wi-Fi Protocol

The Wi-Fi/IEEE 802.11 has three frequency bands, 2.4/5/6 GHz.

Some Typical Crystal or TCXO frequencies for [Wi-Fi](#) Wearables Applications ICs:

Infineon - CYW43012 - 37.4 MHz, 32.768 kHz
CY8C62xA - 16 to 35 MHz , 32.768 kHz

Silicon Labs - WF200 - 38.4 MHz, 32.768 kHz
RS9116 - 40 MHz, 32.768 kHz

Microchip - ATWINC3400A-MU - 26 MHz, 32.768 kHz

Raltron Stub Antennas Solutions

[RST-2400-P-190-IPEX-H](#)
[RST-MB-P-157-SMA-G](#)



The Wi-Fi 6/IEEE 802.11ax has two frequency bands, 2.4/5 GHz.

The Crystals for lower frequencies of Wi-Fi 6 such as 38.4 and 48 MHz, and for higher are 76.8 and 96 MHz

Some Typical Crystals or TCXO frequencies for [Wi-Fi 6](#) Wireless Wearables Applications ICs:

SparkLan - WNFB-266AXI(BT) - 37.4 MHz, 32.768 kHz
AP6281 - 59.97 MHz, 32.768 kHz

[See All Crystal Products](#)

[See Antenna Products for Wi-Fi](#)

Solutions for Bluetooth & BLE Protocol

Bluetooth Low Energy uses the same 2.4 GHz radio frequencies as classic Bluetooth
Some Typical Crystal or TCXO frequencies for [Bluetooth & BLE](#) Wearables Applications ICs:

Infineon - PSoC 6 MCU: CY8C63x6, CY8C63x7 - 16 MHz/32 MHz Crystal Oscillator
16 to 35 MHz, 32.768 kHz On-chip Crystal Oscillators
- 2.4 GHz Chip Antenna

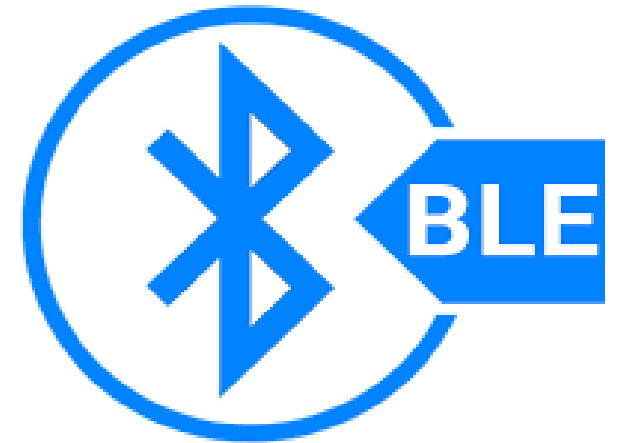
Nordic Semiconductor - nRF52810 - 64 MHz Crystal Oscillator, 32 MHz Crystal
32.768 kHz Crystal Oscillator, 32.768 kHz Crystal
1 MHz/16 MHz/32 MHz Peripheral Clock
- 2.4 GHz Antenna

Texas Instruments - CC2640R2F - 32.8 kHz/48 MHz RC Oscillator, 24 MHz Crystal Oscillator
32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

NXP Semiconductors - MKW39/38/37 - 26 MHz/32 MHz Crystal, 32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

Dialog Semiconductor - DA1469x - 32 MHz Crystal, 32.768 kHz Crystal Oscillator
- 2.4 GHz Antenna

STMicroelectronics - BlueNRG-LPS - 32 MHz Crystal, 32.768 kHz Crystal
- 2.4 GHz Antenna



[See All Crystal Products](#)

[See Antenna Products for Bluetooth](#)

Solutions for Near-field Communication Protocol

NFC operates at 13.56 MHz on ISO/IEC 18000-3 air interface. The technology is a simple extension of the ISO/IEC14443 proximity-card standard(contactless card, RFID).

Some Typical Crystal or TCXO frequencies for [Near-field communication](#) Wearables Applications ICs:

NXP Semiconductors - PN7160_PN7161 - 27.12 MHz Crystal, 40 MHz Oscillator
PN7150 - 27.12 MHz Crystal, 40 MHz Oscillator

STMicroelectronics - ST25R3916 - 27.12 MHz Crystal, 27 kHz RC Oscillator, 32.768 kHz Crystal
ST25RU3993 - 20 MHz TCXO
ST95HF - 27.12 MHz Crystal



[See All Crystal Products](#)

[See Antenna Products for NFC](#)

Solutions for GNSS

Global Navigation Satellite System (GNSS) is the standard generic term for all navigation satellites systems like GPS, GLONASS, GALILEO, BeiDou, QZSS, NAVIC.

Some Typical Crystal or TCXO frequencies for [GNSS](#) Wearables Applications ICs:

Unicore Communications - UC6228CI - 26 MHz TCXO, 32.768 kHz Crystal

STMicroelectronics - STA8100GA - 32.768 kHz Crystal

Maxim Integrated - MAX2769 - 16.368 MHz Crystal

Raltron GNSS Antennas Solutions

[RCA-E-1003E1-TR](#)

[RPA-GP-1575-A-18-IPEX-27-G](#)

[RPA-GP-P-18-G](#)


GPS	BeiDou
L1: 1575.42 MHz / L2: 1227.6 MHz / L5: 1176.45 MHz	B1: 1561.098 MHz – 1589.742 MHz / B2: 1207.14 MHz / B3: 1268.52 MHz
GALILEO	NAVIC
E1: 1575.42 MHz / E6: 1278.75 MHz / E5: 1176.45 – 1204.14 MHz	L5: 1176.45 MHz / S: 2492.028 MHz
GLONASS	QZSS
L1: 1598.0625 - 1604.40 MHz L2: 1242.9375 - 1248.63 MHz	L1C/A, L1C, L1AIF, L1S, L1Sb: 1575.42 MHz / L2C: 1227.60 MHz / L5, L5S: 1176.45 MHz / LEX: 1278.75 MHz / S-band: 2GHz

Frequency Band

[See All Products for GNSS](#)

Raltron Solutions - MHz Crystals

Raltron Crystals Solutions

Part #	Size(mm)	Product Series	Datasheet	Image	Contact Us / Buy Now
R1612-27.120-8-F-3030-EXT-TR	1.60 x 1.25 x 0.32	R1612 View products in stock			Buy Now
R2016-48.000-8-F-1030-EXT-TR	2.00 x 1.60 x 0.50	R2016 View products in stock			Buy Now
R2520-27.120-8-F-3030-EXT-TR	2.50 x 2.00 x 0.65	R2520 View products in stock			Buy Now

Typical Frequencies:

16 MHz, 26 MHz, 32 MHz, 37.4 MHz, 38.4 MHz, 40 MHz, 48 MHz, 59.97 MHz, 64 MHz

[See All Crystal Products](#)











Raltron Solutions - Oscillators

Available Oscillators Packages

Part #	Size(mm)
CO2016-32.000-3.3-50-EXT-TR	2.0 x 1.6
CO2520-48.000-3.3-50-X-T-TR	2.5 x 2.0
CO2016-0.032768-3.3-25-X-T-TR	2.0 x 1.6
CO2520-0.032768-3.3-50-X-TR	2.5 x 2.0

Stock at our Distributors

Product Series	Datasheet	Product Series	Datasheet
CO2016 View products in stock			Buy Now
CO2520 View products in stock			Buy Now
COM1 View products in stock			Buy Now
COM2 View products in stock			Buy Now

[See All Products for Oscillators](#)



Raltron Solutions - Tuning Fork 32.768 kHz

Available Tuning Fork Crystal Packages

Part #	SIZE(mm)
RT1210-32.768-9-TR	1.2 x 1.0
RT1610-32.768-12.5-TR	1.6 x 1.0
RT2012-32.768-7-20-EXT-TR	2.0 x 1.2
RT3215-32.768-7-TR	3.2 x 1.5
RSE-32.768-12.5-H14-TR	6.9 x 1.4

Typical example of IC for Wearables Applications using a 32.768 kHz crystal as frequency reference:

Texas Instruments - CC2642R

Using 32.768 kHz crystal

CL: 6, 7 or 12 pF

ESR: 100 kΩ max

[See All Crystal Products](#)



Stock at our Distributors

Product Series	Datasheet	Image	Contact Us / Buy Now
RT1210 View products in stock			Buy Now
RT1610 View products in stock			Buy Now
RT2012 View products in stock			Buy Now
RT3215 View products in stock			Buy Now
RSE H14			Buy Now

Load capacitance values: 6 pF, 7 pF, 9 pF and 12.5 pF

Frequency Tolerances: ±20 ppm and ±10 ppm



Raltron Solutions - TCXOs and VCTCXOs




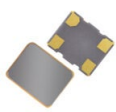
Raltron TCXOs Solutions

Part #	Size(mm)
RTX-1612BD32-S-52.000-TR	1.6 x 1.2
RTX-2016AD333-S-26.000-TR	2.0 x 1.6
RTX-2520AF32-S-48.000-TR	2.5 x 2.0
RTX-1612KD3X-C-0.032768-TR	1.6 x 1.2

- Tighter Stability: ± 0.5 ppm \sim ± 2.5 ppm, $-40 \sim +85^{\circ}\text{C}$
- Improved Frequency Tuning Characteristic
- Superior Phase Noise Performance (-130 dBc/Hz on the floor)
- Range Supply Voltage: 1.8 V \sim 3.3 V
- Typical Frequencies: 10.0 MHz, 16.0 MHz, 19.2 MHz, 20.0 MHz, 26.0 MHz, 32.0 MHz, 38.4MHz, 48.0 MHz, 50.0 MHz, 52.0 MHz

[See All TCXOs Products](#)













Stock at our Distributors

Product Series	Datasheet	Image	Contact Us / Buy Now
RTX-1612 View products in stock			Buy Now
RTV-2016 View products in stock			Buy Now
RTX-2520 View products in stock			Buy Now



Raltron Solutions – Antennas

Raltron Antennas Solutions

Part #	Datasheet	Image	Frequency(MHz)	Contact Us / Buy Now
RCA-3216-A1-TR	 PDF		BLUETOOTH: 2450±50	Contact Us
RCA-5220-A0-TR	 PDF		BLUETOOTH: 2450±50	Buy Now
RCA-E-3216-A2-TR	 PDF		BLUETOOTH: 2400~2483.5	Contact Us
RCA-E-3216-E1-TR	 PDF		GPS: 1575	Contact Us
RCA-W2-P-3216-A29-G	 PDF		BLUETOOTH: 2545	Contact Us
RCA-W2A1-3216-Z-040	 PDF		2400~2500	Buy Now

[See Antenna Products for Wi-Fi](#)

[See Antenna Products for Bluetooth](#)

[See Antenna Products for GNSS](#)





[See Antenna Products for ZigBee](#)

[See Antenna Products for NFC](#)



Raltron Products – LTCC Filters, Baluns and Diplexers

Raltron LTCC Filters, Baluns and Diplexers Solutions

Part #	Datasheet	Size(mm)	Contact Us / Buy Now
RCF-5500.000-700000-1005-W-001		1.00 x 0.50 x 0.40	Contact Us
RBL-2430.000-1005-EV-001		1.00 x 0.50 x 0.40	Contact Us
RCDI-24-49-1608-W-TR		1.60 x 0.80 x 0.60	Contact Us
RCDI-W2A1-W5A17-1608-W-TR		1.60 x 0.80 x 0.60	Contact Us

[See All LTCC Filters, Baluns and Diplexers Products](#)



Contact



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