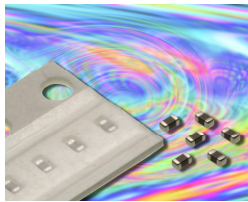


# Chip RF Inductors

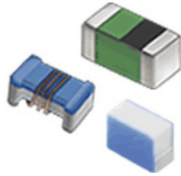
## Product Presentation



### **Comments:**

Welcome to this presentation on muRata's Chip RF Inductors. Here we will review a little basic theory and touch on some of the more important applications for RF Inductors and related products. We hope you will find it enjoyable and educational.

## Applications of RF Inductors

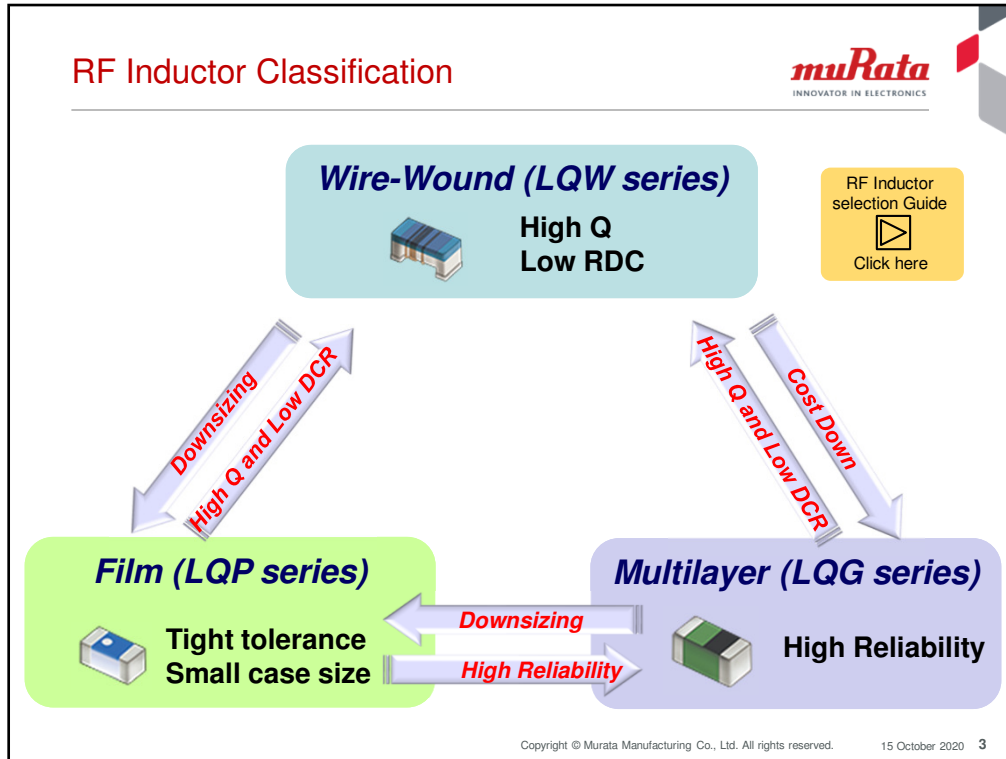


Application	Location	Purpose
Matching	Lines between components in antenna and IF blocks, etc.	Eliminating impedance mismatch and minimizing reflection and loss
Resonance	Synthesizers and oscillation circuits	Securing the required frequencies
Choke	Power supply lines of functional components used in RF and IF blocks	Cutting AC currents such as high-frequency components

### **Comments:**

Inductors have many different uses, and a variety of product types are available according to the application. Murata offers a diverse lineup of chip inductors classified by application into the three types of inductors.

RF inductors for high-frequency circuits are used in the high-frequency band from 10 MHz to several GHz. As these products require a high Q (Quality factor) value, most have a non-magnetic core structure, and they are mainly used in the high-frequency circuits of wireless communications, such as Cellular, WiFi, Bluetooth, and others.



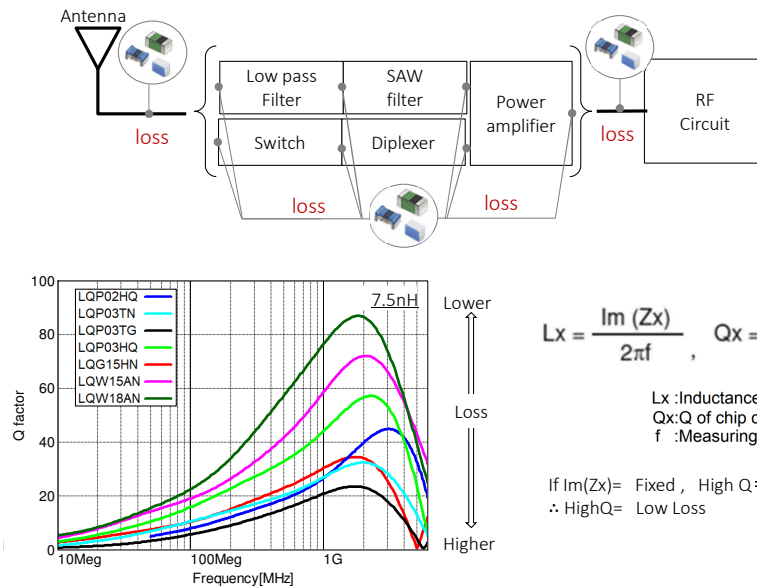
**Comments:**

Murata has three types of non-magnetic RF Inductor classifications, each incorporating a different technology:

- (1) The LQW is our Wire-wound series; it features High Q and Low RDC.
- (2) The LQP is our Film series; it features Tight tolerance and Small case size.
- (3) The LQG is our Multilayer series; it is characterized by high performance reliability.

## RF Inductor for Matching

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### Comments:

In high frequency circuits, it is important to perform impedance matching between circuits. Impedance matching is to match the output impedance of the sending side circuit, and the input impedance of the receiving side circuit in the signal transmission path. By matching the impedance, the power on the sending side can be transmitted at the maximum to the receiving side. Although a capacitor and inductor are used in the matching circuit, the actual capacitor and inductor are not ideal components, and a loss will be generated.

There is a Q to express this loss. When the Q is higher, it shows that the capacitor and inductor have less loss.

## Applications of RF Inductors

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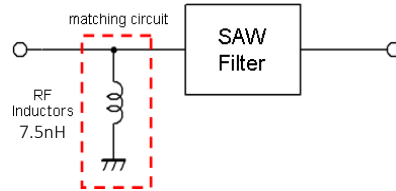


Figure 1: Example of a Matching Circuit.

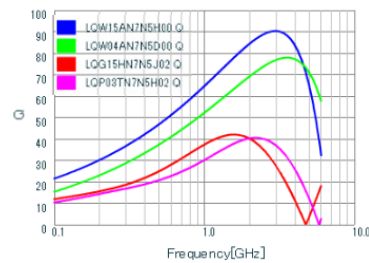


Figure 2: Comparison of RF Inductor Q (both 7.5nH)

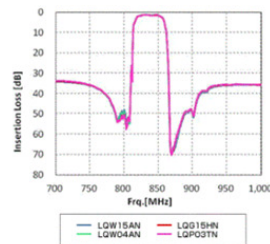


Figure 3: Overall Characteristics of SAW Filter

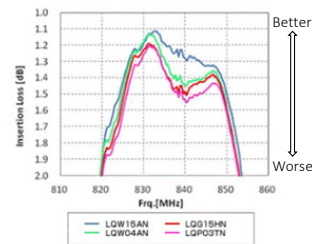


Figure 4: Pass Band Characteristics of SAW Filter

Source : RF Inductors – Practical knowledge

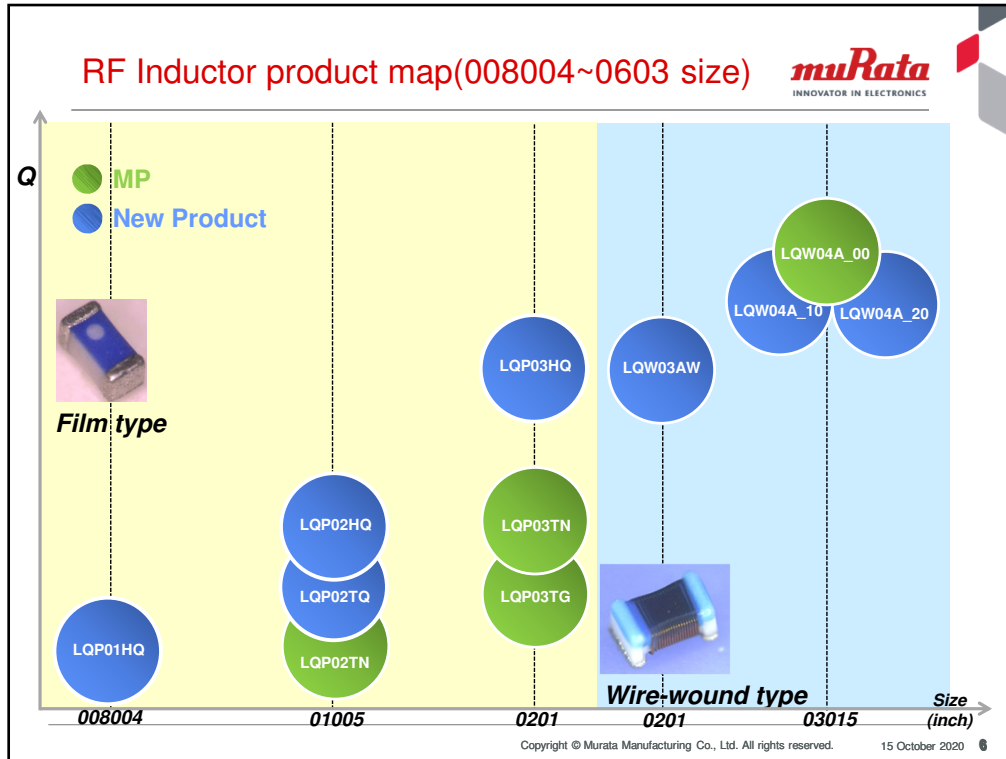
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### Comments:

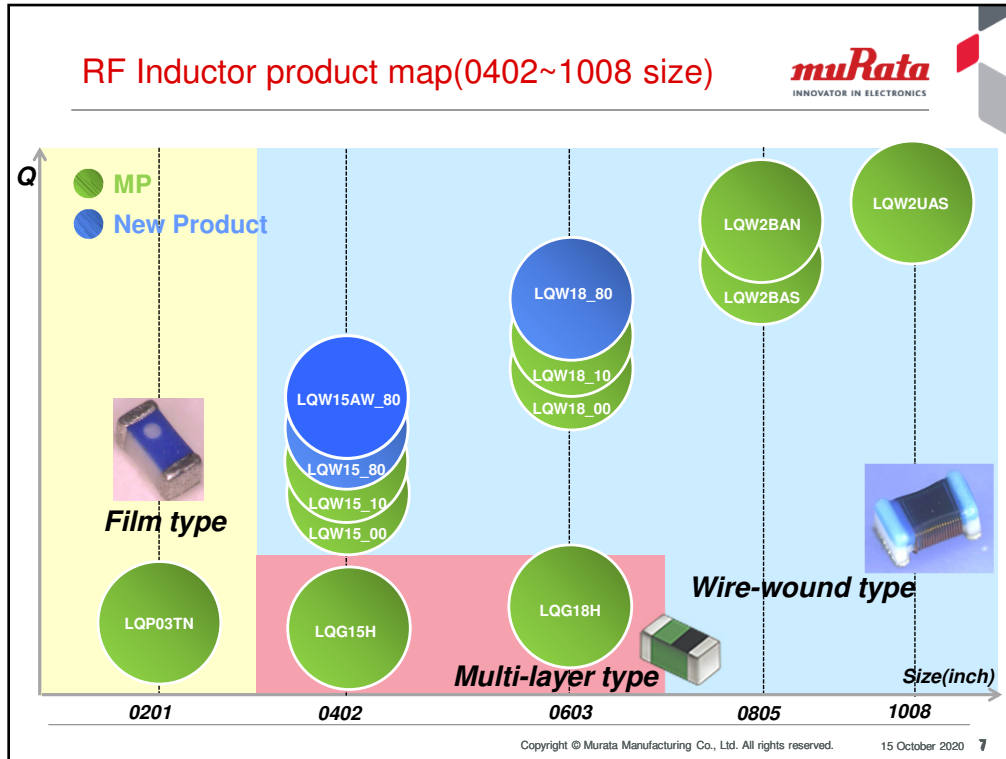
The loss in high frequency circuits is affected by the level of inductor Q used for matching circuits. In order to confirm this, Murata's SAW filter and RF inductor were used to replace the RF inductor with a different Q in the matching circuit, and the insertion loss of the SAW filter was measured and compared.

As you can see Figure 4, it can be confirmed that the insertion loss of the SAW filter differs by the RF inductor used. From the results of this test, it is clear that when the level of the RF inductor Q is higher (low loss) the insertion loss of the SAW filter becomes less. Accordingly, the level of the inductor loss is important for RF circuit.



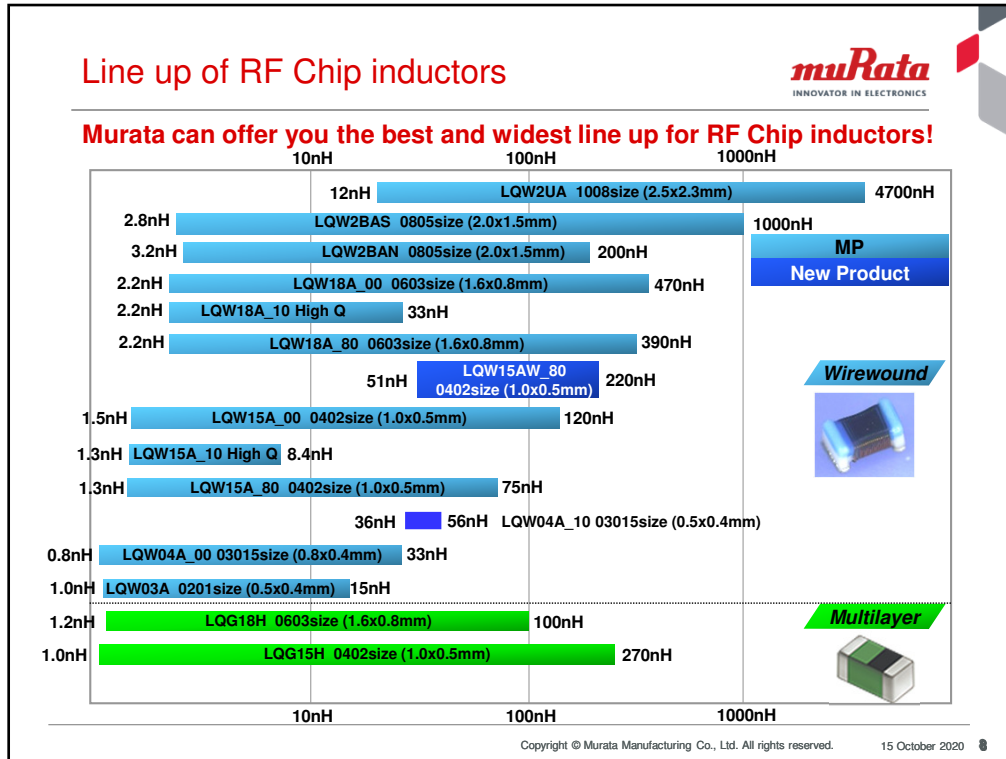
### Comments:

This slide shows the Murata's surface mount RF inductor product line up of thin film type and wire wound type construction offered for a variety of RF Inductor applications . The chip case sizes range is from 008004 inch to 1008 inch.



### Comments:

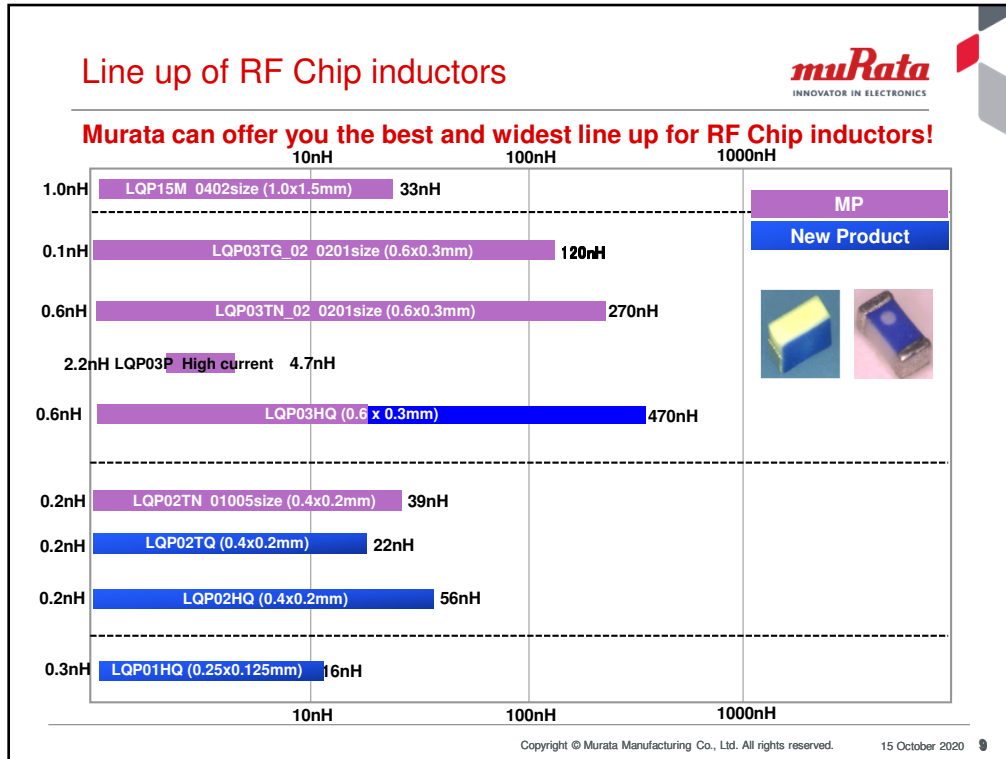
This slide shows the Murata's surface mount RF inductor product line up of thin film type and wire wound type construction offered for a variety of RF Inductor applications . The chip case sizes range is from 0402 inch to 1008 inch.



### Comments:

This slide shows the inductance value range of each RF inductors. wire-wound type : LQW series is from 0.8nH to 4700nH while the Multilayer type: LQG series is from 0.7 to 270nH.





### Comments:

This slide shows the Film type : LQP series is from 0.1nH to 470nH. Murata is continueally developing new RF inductors and expanding the value range, according to new emerging market application requirements .

# “SimSurfing”

## web-based design tool

<http://ds.murata.co.jp/software/simsurfing/en-us/>



This "SimSurfing" supports viewing/downloading the characteristics data of Murata components and makes it easier to select them.



SimSurfing Product Lineup - Select from the following.

Capacitors	Inductors	Ferrite Beads	Common mode Choke Coils
Thermistors	Timing Devices		

### Comments:

SimSurfing is Murata's newest design tool.

SimSurfing gives the user the option of pre-selecting a known part number from a list or by inputting the part based on characteristics such as case size, inductance, and rated current. SimSurfing also allows users to plot actual measured data for each selected part. It includes Impedance vs. Frequency, Resistance vs. Frequency, and Q vs. Frequency. Design engineers can also utilize the S-parameters and Netlist provided in SimSurfing to simulate and examine the part's performance.

## Technical support tools

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### Noise filter design support tool

on SimSurfing

[Click here >](#)

- ◇ You can select parts for noise filter while simulating insertion loss of filter combining ferrite beads, L, common choke, and C.
- ◇ Recommend filter circuits and products are displayed by choosing the target frequency.
- ◇ Available online, no download required.



**DC-DC converter design support tool**  
on SimSurfing

◇ Assist inductor/capacitor selection in terms of efficiency & ripple  
◇ Available online, no download required

The banner includes a circuit diagram of a DC-DC converter with components labeled SW1, SW2, VS, IL, and VS2. It also features a graph showing Efficiency (%) on the y-axis (ranging from 70 to 100) versus Frequency (kHz) on the x-axis (ranging from 1m to 100k). The graph shows two curves: one for efficiency and one for ripple. To the right of the graph are images of various electronic components, including capacitors and inductors.



Noise Suppression Filter



Inductors

- ◇ FAQ  
Characteristics, Quality, Reliability, Environment, etc

[Click here](#)

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### Comments:

In addition to SimSurfing, Murata offers several support tools. There are Noise Filter design Support Tool (NFST) and Murata Power Simulation Tool (MPST) along with FAQ of inductors.

NFST supports the user to select parts for noise filters while simulating insertion loss of filter combining EMI filters and capacitors. Recommend filter circuits and products are displayed by choosing the target frequency. MPST supports the user to select power inductors and capacitors while simulating power efficiency, ripple, inductor loss, etc. Also, Murata offers Inductors FAQ on the web site to support a variety of users to design their next new design projects.

## Summary

- ❑ Murata has three types of RF Inductor technologies. They are:
  - 1.) Wire-wound (LQW series)
  - 2.) Film (LQP series)
  - 3.) Multilayer (LQM series)
- ❑ Each technology offers different features and benefits:
  - Wire-wound: High Q, Low RDC.
  - Film: Tight Tolerance, Small Case Size
  - Multilayer: Lower Cost
- ❑ Murata's RF Inductors are suitable for various high frequency applications from several MHz to several GHz.
  - They are mainly used in the high-frequency circuits of mobile communications devices, such as smartphones, wireless LAN, wireless PAN(Bluetooth, Zigbee etc) and others.

### **Comments:**

Murata offers three types of surface mount RF Inductors available in various tolerances to allow for a wide variety of RF circuit matching requirements .

For a complete review of Murata's Chip RF Inductors, please refer to the Mouser website.