Rx COIL FOR HIGH FREQUENCY WIRELESS POWER TRANSFER

Product Name

Wireless Charging Coil - High Frequency Receive

Molex PN	Part Description
1461798001	Wireless Charging Coil - High Frequency Receive

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High Frequency Low Power Rx

Rx COIL FOR HIGH FREQUENCY WIRELESS POWER TRANSFER

FEATURES

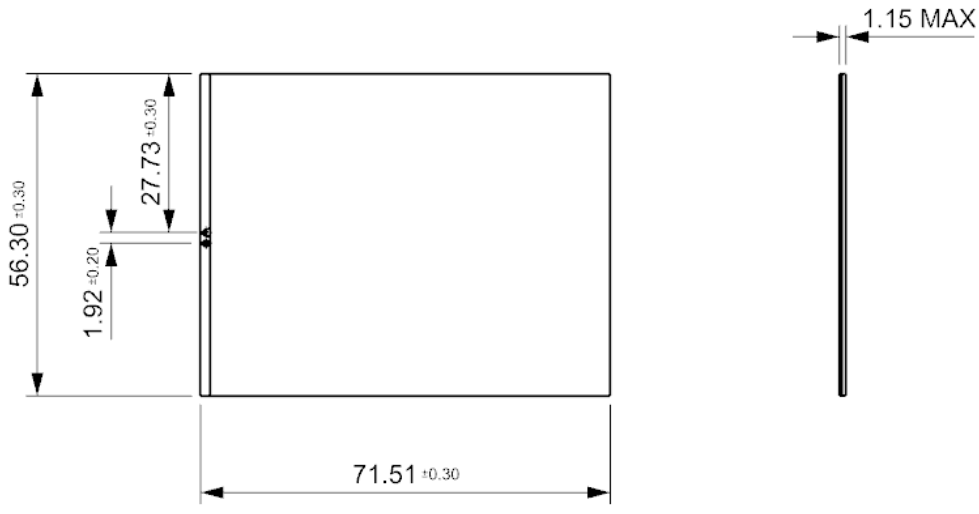
- Industry's highest PCB Q Factor
- Wearable and small form factor design
- Industry leading thinness of 1.15 mm MAX(w/shield)
- Enables high efficiency solutions
- PCB construction:
  - Increased durability
  - Repeatable performance
  - Integration with other electronics
- Custom design available

Molex Part Number

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Electrical Parameters at 25°C			
Inductance +/-2%, @ 6.78 MHz (uH)	DCR +/- 2% (mOhm)	ESR +/- 2% (mOhm)	Quality factor
2.9	120	710	160

Mechanical Parameters (mm)		
Coil Thickness	Assembly Thickness (w/shield)	Material
0.60	1.15 MAX	FR4



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GENERAL DESCRIPTION:
This specification describes a PCB receiver coil for wireless power transfer at frequencies 6.78 MHz. The information in this document is for reference and benchmark purposes only. The user is responsible for validating coil performance based on users own testing environment.

PRODUCT DESCRIPTION:
This high efficiency coil is designed for high performance wearable or any other device / accessory requiring up to 5W power out. Standard PCB construction enables integration with other electronics, high durability, and consistent performance.

DEFINITIONS:
Equivalent Series Resistance (ESR): resistance measured at or around the operating frequency. ESR accurately characterizes any losses such as skin effect or proximity effect and any additional effects that may occur in the presence of material such as shielding, metal backing, or the housing. Comparison of coil assembly and in situation ESR measurements can accurately determine sources of loss. This metric should be given serious consideration during product selection to ensure full characterization of system electrical parameters.

Direct Current Resistance (DCR): resistance measured at DC or measured at very low frequencies (60 Hz - 100 Hz) and is often considered an incomplete measurement in wireless charging environments because it does not take into account actual causes of resistance during operation. NuCurrent recommends ESR as the most relevant measurement of resistance in a wireless power coil, but provides DCR values as well.

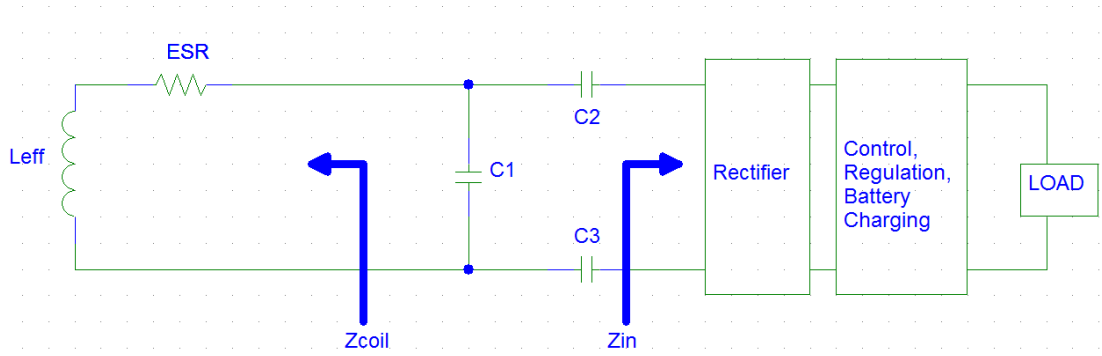
PRODUCT TUNING:
It is important to optimize the tuning circuit for every application. Improper tuning can lead to inferior system performance even if the individual system blocks, including the coil, comprise high performance components.

The objective of the matching circuit is to resonate the inductive coil (Z_{COIL}) and match it to Z_{IN} (See diagram below). Z_{IN} may be variable; for example when charging a battery, there is a swing in the Z_{LOAD} value which may translate to a swing in Z_{IN}. Instead of optimizing for the full swing in $Z_{IN,}$ a relatively straightforward approach to keep losses low may be to match for maximum efficiency when Z_{IN} is at full load (peak power draw).

A generic tuning/matching network (C1, C2, C3) is provided below as a typical system for wireless charging using magnetic resonance coupling. The topology is a shunt-series-differential-capacitor network. Depending on the application, choice of ICs, effective self-Inductance of the coil (L_{EFF}), and coupling with the transmitter, a derivative topology (e.g. single-ended series, differential series, etc.) may also be implemented.

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With regards to the capacitor-network, the choice of topology is dependent on the desired $V_{RECTIFIER}$ and the receiver coil selection. A good rule of thumb to determine the **relative** $V_{RECTIFIER}$ between different receive coils is to compute the product L_{EFF} x A_{EFF}, where A_{EFF} is the effective area of the coil. Series tuning is typically preferred for high L_{EFF} coils with good coupling (to the transmitter) to induce a $V_{RECTIFIER}$ within the desired range (typically 7V - 15V for a 4W - 7W receiver). Shunt tuning can be used with very low L_{EFF} coils with low coupling. In general, the shunt helps boost the $V_{RECTIFIER}$. Shunt-series tuning may be used for coils which demonstrate intermediate coupling with the transmitter; this topology also offers more flexibility towards designing for Z_{IN}.

SMT inductors (not shown) may be added in series with C2 and/or C3 to block high frequency harmonics. An EMI filter may also be utilized to prevent harmonics generated at the rectifier stage to re-enter the wireless link.

In order to account for the effect of the environment on the coil, all measurements, including Z_{COIL}, should be performed in-situ, i.e. the coil assembly placed in its intended location in the end application.

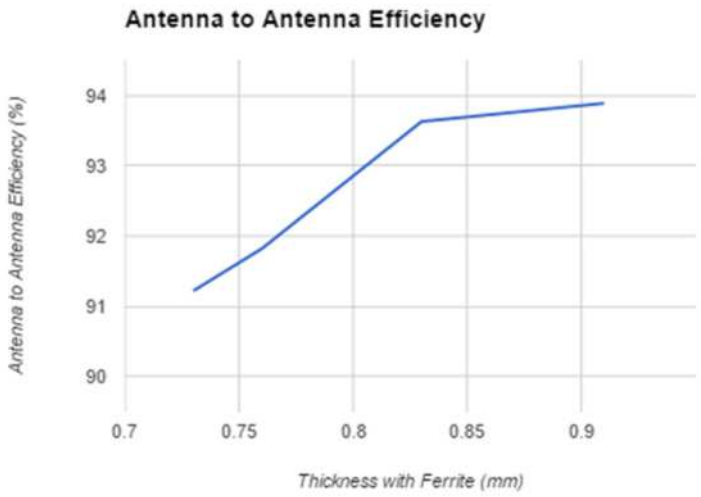
Finally, the choice of the matching topology and filtering components is a function of the desired performance, complexity and BOM.

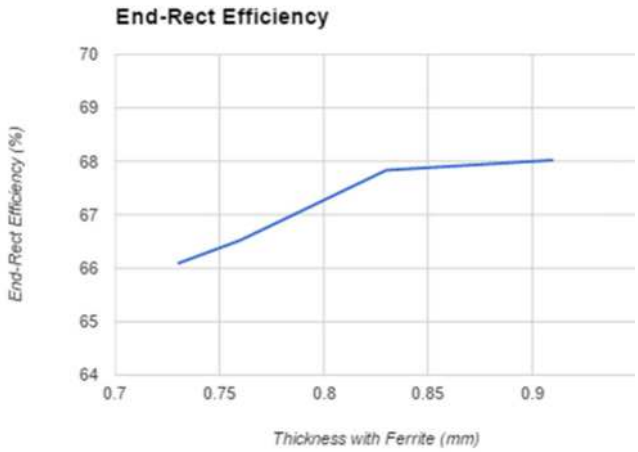
For detailed product specific tuning information, please contact Molex at www.molex.com or via phone 1 800-78MOLEX (1 800 786-6539).

PERFORMANCE:
For custom applications, Molex and NuCurrent can optimize antenna assemblies for thickness, price or efficiency. The data below demonstrates the performance of the coil up to 5W.

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- Coil assembly (coil and ferrite) were used for all tests
- Power out for all test = 5W
- End-Rect Efficiency is defined as Rectified Power/Input Power

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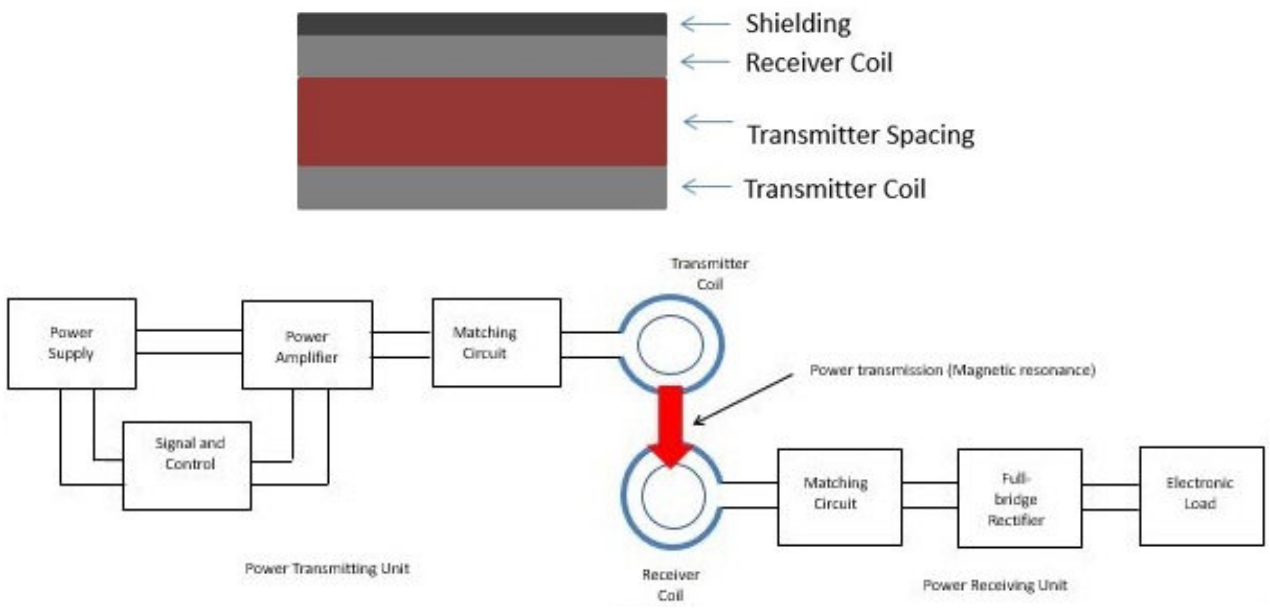
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GENERAL REQUIREMENTS:

A. CONNECTIONS FOR TESTING

I. 34AWG copper wire recommended for through-hole soldering

B. RECOMMENDED TEST SETUP



Test Setup Block Diagram

REFERENCE DOCUMENTS:

Please see Company website for more information.