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DIRECT

Electronics Tech.

(TR4308I) RFID Transponder Inductor

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Product Introduction

Transponder Coils (TR4308I) is The Key of Radio Frequency Identification (RFID) System.

Features :

- High Q value.
- Low profile with an extended length.

Applications :

- Car remote control key.

Direct (TR4308I) RFID coil series is specified for RFID applications for the best performing designed at 125 kHz. The (TR4308I) covers a wide range of electrical performances and offers better sensitivity, greater read distance and higher SRF than other coils its size.

The TR4308I's length and cross section area are optimized for best sensitivity in the coil axis. The coil is wound on a plastic base, providing great durability and allowing this part to withstand harsh mechanical shock. With operating temperature range to 125℃, these coils are ideal for a wide range of applications.

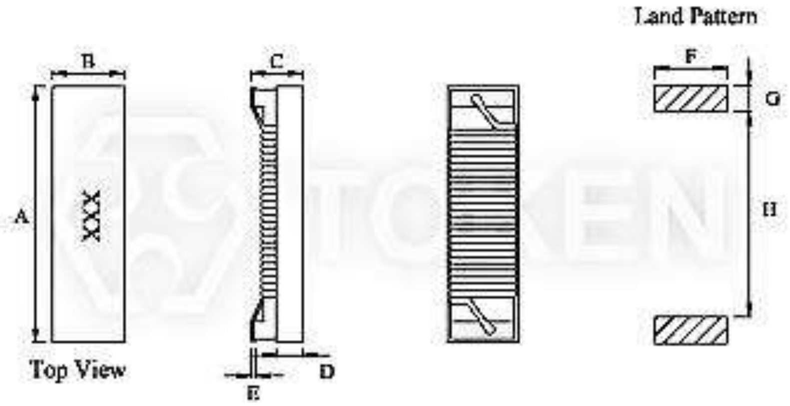
Radio Frequency Identification (RFID) is the system of using radio signals to send information identifying a particular situation or item. Direct (TR4308I) is suited for wireless data transmission in low frequency RFID products, such as immobilizers, TPMS, keyless entry. Other industrial applications include access control and tracking devices.

In addition to our standard models, Direct can design RFID coils to operate at other frequencies. Customized inductance values are available on request. Contact us with your specific needs. For more information, please link to Direct official website "RF Inductors".

Configurations & Dimensions

Configurations & Dimensions (Unit: mm) (TR4308I)

Type	A	B	C	D	E	F	G	H
TR4308I	11.43	3.15	2.74	1.01	0.51	2.79	1.78	8.46



RFID (TR4308I) Dimensions

- **Note: Design as Customer's Requested Specifications.**

TR4308I Characteristics

Electrical Characteristics (TR4308I)

Part Number	Inductance (mH)	Q (min)	Test Freq. (KHz)	SRF (KHz)(min)	DCR (Ω)(max)
TR4308I - 401J	0.40	15	125	4500	7.4
TR4308I - 901J	0.90	15	125	4000	22
TR4308I - 112J	1.08	15	125	4000	25
TR4308I - 202J	1.97	17	125	2400	34
TR4308I - 242J	2.38	17	125	2200	39
TR4308I - 332J	3.30	17	125	1800	51
TR4308I - 412J	4.15	17	125	1700	74
TR4308I - 492J	4.90	17	125	1300	96
TR4308I - 682J	6.80	17	125	1000	112
TR4308I - 712J	7.10	17	125	1000	115
TR4308I - 812J	8.10	17	125	960	123

- **Note: Test Freq.: 125 KHz / 0.25V.Operating Temp.: -40℃+85℃.**

RFID Transponder Applications

RFID, Radio Frequency Identification System and Applications

RFID, Radio Frequency Identification, is the system of using radio signals to send information identifying a particular item. The most common application of RFID is to track and locate any subject including material, or moving item.

The RFID coil is part of the coupling device and acts as the transmitting antenna. The main specifications of the RFID coils are sensitivity and read distance; however, the inductance of the RFID coil directly influences the sensitivity and the read distance. Generally, a higher inductance provides greater sensitivity resulting in a longer read distance.

There are two major components in an RFID system:

- **Tag:**
  The transponder programmed with unique information. The tag consists of an integrated circuit and a coupling device. The integrated circuit stores specific data unique to that tag.
- **Reader:**
  The interrogator includes a decoder to interpret data. The coupling device interfaces with the reader.

The manufacturer of the tag usually specifies the inductance of the coil to be used. The read distance is defined as the maximum distance from the reader that the transponder responds to the reader's magnetic field. The reader produces a magnetic field that triggers the tag. When the reader receives the transmitted data, it interprets the data and takes appropriate action as shown in figure 1.

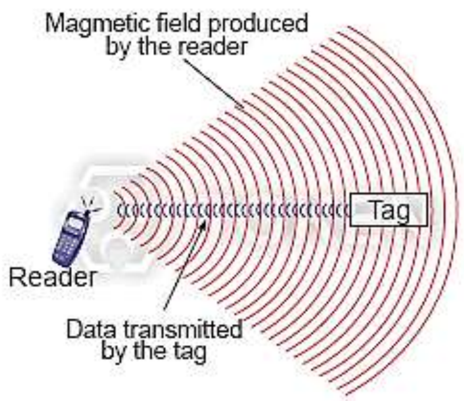


Figure 1. RFID System

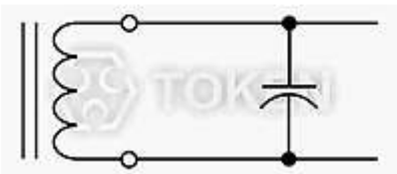


Figure 2. LC Circuit

When the transponder enters the field produced by the reader, the coil produces a voltage inside the tag. In an active transponder, the voltage is used to wake the tag and use its internal battery. In a passive transponder, this voltage can be used to power the tag. Active transponders generally have longer read distances, shorter operational life and are larger and more costly to manufacture. Passive transponders are generally smaller, have a longer life and are less expensive to manufacture.

For optimum performance, the RFID coil is used in a parallel LC circuit as shown in figure 2. Adding a capacitor to the circuit maximizes the read distance. The LC circuit is designed to resonate at the operating frequency of the reader. To calculate the value of the capacitor, use the following **equation: Capacitance (C) = 1 / (Inductance L × (2π × Frequency *f*))** ^{2}

Order Codes

Order Codes (TR4308I)

TR4308I	-	401	J

Part Number
TR4308I

Inductance	
401	0.40(mH)
901	0.90(mH)
112	1.08(mH)

Tolerance	
J	5%

- **Note: Design as Customer's Requested Specifications.**

General Information

Direct Cuts Inductor Size and Cost

Direct utilizes the latest technology enabling the most cost-effective designs in manufacturing inductors. The 0402, 0603, 0805, 1206, 1210, to 1812 series of RF Miniature Inductors all contain wire wound or multi-layer technology with material substrate in ceramic or ferrite cores. Thus providing economic cost with the ultimate performance demanded by today's RF applications. Inductors feature high Q factor, SRFs (self-resonant or series resonant frequency), and Idc (maximum current carrying capacity).

How to quickly search RF inductors for all of the characteristics?

Searching and comparing data sheets of inductor manufacturers can be time consuming.
Direct’s Parameter Sorting Search Mode allows selection of inductors based on different parameters.
To enter Searching Mode:

- By entering just the inductance value,
- By sorting parameter to narrow down searching range,
- Or by enter keyword / part number / size dimensions L*W*H to partial or exact searching.

Inductors Selection Notes:

For choke applications, the SRFs (self-resonant or series resonant frequency) is the frequency that provides the best signal blocking.

- At the SRF, impedance is at its maximum.
- At frequencies below the SRF, impedance increases with frequency.
- At frequencies above the SRF, impedance decreases with frequency.

For higher order filter or impedance matching applications, in general, the choice of inductance value typically determines the SRF and vice versa. The higher the inductance value, the lower the SRF, due to increased winding capacitance. It is more important to have a relatively flat inductance curve (constant inductance vs. frequency) near the required frequency. This suggests selecting an inductor with an SRF well above the design frequency. A rule of thumb is to select an inductor with an SRF that is a decade (10X) higher than the operating frequency.

What is Q factor? High Q leads to low insertion loss, minimizing power consumption, and narrow bandwidth. It is important if the inductor is to be used as part of an LC (oscillator) circuit or in narrow band pass applications. In general, wire wound inductors have much higher Q values than multilayer inductors of the same size and value. Direct's material science and manufacturing expertise effectively bridges the gap between wire-wound performance and multi-layer inductors with its TRMF100505 (EIA 0402) and TRMI160808 (EIA 0603) series.

How does current requirement affect inductor? Higher current requires larger wire or more threads of the same wire size to keep losses and temperature rise to a minimum. Larger wire lowers the DCR and increases the Q factor. Using a ferrite core inductor with a lower turn count can achieve higher current capacity and lower DCR. Ferrite, however, may introduce new limitations such as larger variation of inductance with temperature, looser tolerances, lower Q, and reduced saturation current ratings. Direct's ferrite inductors with open magnetic structures, will not saturate, even at full rated current.