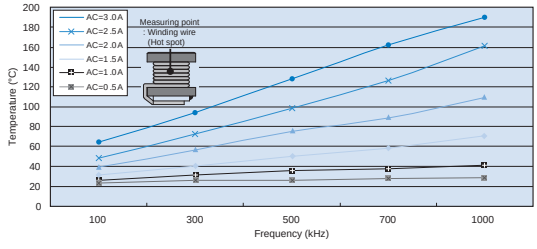
Precautions for the Inductors

Refer to the precautions of common matters for all products in the beginning of this catalog for the matters common to all products.

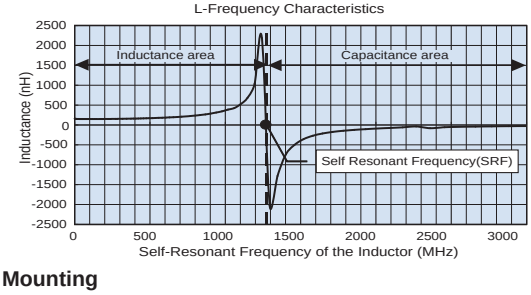
Inductors in General

- Characteristics such as the inductance, Q value etc. are frequency dependent.
- The stress from resin coating and molding can result in change of inductance.
- Since the inductors use ceramic materials, chipping and cracking can occur. Please be careful when handling. Excessive vibration and impact could destroy the parts.
- Keep magnetic tweezers and other magnets away from the inductors to avoid change of inductance caused by magnetization. Do not press the wire wound part of the chip inductor with sharp objects.
- The inductance could decrease according to magnetic saturation when the inductor is used exceeding the allowable current. There is also a possibility of disconnection and short-circuit or emitting smoke and ignition caused by the heat generation of the inductor.
- There is a risk of disconnection when excessive current (inrush current) is applied. Change of the characteristics may occur by the magnetization of the core when excessive current is applied to a DC circuit.
- When the parts are used at high-frequency, the heat generation will be larger and the part temperature will be higher compared with DC or low-frequency. This is caused by increasing iron loss and copper loss. Please be careful not to exceed the operating temperature rise by high frequency.



Ex. Temperature rise by high frequency

- The electrical characteristics change from the variation of frequency of the parts. When the part is used above the frequency band of the SRF (self-resonant frequency), it will function as a capacitor. Please do not use the parts above the SRF.



Mounting

- Some of the inductors have magnetic polarity to which attention should be paid when mounting.
- The inductance and Q values of a non-magnetically-shielded inductor could change from magnetic coupling affected by other components, chassis, patterns, etc. When mounting in high density, check the characteristic in advance with the actual equipment. Additionally, take care of the positioning of the components since closely mounted inductors may cause magnetic coupling. Do not place large magnetic materials like audio speakers, etc. near the inductors.
- Do not expose the inductors to the heat radiation from other high temperature parts.

Reference

- For basic precautions, please refer to the Technical report of JEITA RCR-2501C Safety application guide for inductors for use in electronic equipment.

Terms and Definitions

Nominal Inductance

- Inductance that the inductor is designed to have and generally indicated on the body.

Q Value (Quality factor)

- A coefficient that shows the quality of the inductors. It is calculated from the following formula shown below.

$$Q = \frac{\omega L}{R}$$

w = Angular Frequency ($\omega=2\pi f$)
L = Inductance
R = Resistance

Self-Resonant Frequency

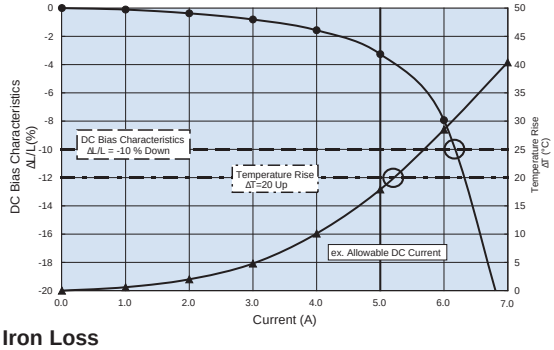
- Frequency that resonance occurs by the distribution capacity and inductance of the inductor.

DC Resistance Value

- Resistance value at DC.

Allowable DC Current

- Upper limit of the current which is set to assure the safe use of the inductor.
- It is defined as the smaller DC current value of either the DC superposition or the surface temperature rise characteristics.
- DC superposition characteristic is a phenomenon which occurs when the inductors, made with magnetic materials such as ferrite, have a large DC current applied. When this occurs, the inductance drops because of the magnetic saturation.
- The plot below shows the relationship between the DC superposition and the surface temperature rise.



Iron Loss

- Electrical energy that is lost when the wire wound magnetic material is magnetized by the applied AC. It is calculated by the sum of hysteretic loss and eddy-current loss.

Copper Loss

- Energy that is transformed into Joule heat by the resistance of the wound wire. The Copper loss increases in the high frequency band from the skin effect.